

2005 Mississippi Curriculum Framework

Secondary Building Trades

(Program CIP: 46.0000 – Construction Trades, General)

Direct inquiries to

Program Coordinator
Trade, Technical, and Engineering Related Technology
Office of Vocational and Technical Education
Mississippi Department of Education
P.O. Box 771
Jackson, MS 39205
(601) 359-3940

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Research and Curriculum Unit for Workforce Development
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Attention: Reference Room and Media Center Coordinator
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Acknowledgments

Writing Team: Jarvis Jernigan, Leland Vocational Center, Leland
Phillip Manning, North Forrest High School, Hattiesburg
Billy Matkins, New Albany-Union County Vocational
Center, New Albany

RCU Staff: Patty Jenkins – Research, Curriculum, and Assessment
Specialist

MDE Staff: Sam Davis – Trade, Technical, and Engineering Related
Technology Program Coordinator

**Professional Curriculum
Advisory Team:** Mississippi Construction Education Foundation, Ridgeland

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Academic Standards Mississippi Department of Education Subject Area Testing
Program

**Workplace Skills for the 21st
Century** Secretary's Commission on Achieving Necessary Skills

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Foreword

Secondary vocational-technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act III, 1998; and No Child Left Behind Act of 2001).

Each secondary vocational-technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Suggested Objectives
 - A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies.
 - The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.
- Suggested Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Suggested Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

- Integrated Academic Topics, Workplace Skills, Technology Standards, and Occupational Standards - This section identifies related academic topics as required in the Subject Area Assessment Program (SATP) in Algebra I, Biology I, English II, and U. S. History from 1877, which are integrated into the content of the unit. It also identifies the general workplace skills as identified in the Secretary's Commission on Achieving Necessary Skills (SCANS) report as being critical for all workers in the 21st Century. In addition, national technology standards and occupational skills standards associated with the competencies and suggested objectives for the unit are also identified.
- References - A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

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Program Description

Building Trades is an instructional program that prepares an individual for employment or continued education in the occupations of Carpentry, Electrical Wiring, Masonry, or Plumbing. Building Trades I is a basic course teaching fundamentals of safety, tools, math, and basic carpentry, electrical, masonry, and plumbing skills. Building Trades II is a continuation of Building Trades I and provides advanced instruction and practical applications in each area.

Certification by the National Center for Construction Education and Research (NCCER):

This curriculum has been aligned to modules in the Contren Learning Series as endorsed by the National Center for Construction Education and Research (NCCER). Students who study this curriculum using the Contren Learning Series materials under the supervision of an instructor who has been certified by the NCCER are eligible to be tested on each module. Students who successfully pass these tests may be certified to the NCCER by the instructor and will receive documentation from NCCER.

Course Outline

Building Trades I

Course CIP Code: 46.0490

Unit	Title	Hours
Unit 1:	Introduction and Orientation	15
Unit 2:	Basic Safety	15
Unit 3:	Basic Math	15
Unit 4:	Hand and Power Tools	20
Unit 5:	Introduction to Blueprints	20
Unit 6:	Materials Used in Building Trades	16
Unit 7:	Basic Rigging	10
Unit 8:	Introduction to Carpentry	40
Unit 9:	Introduction to Electrical Wiring	20
Unit 10:	Introduction to Masonry	30
Unit 11:	Introduction to Plumbing	20

Building Trades II

Course CIP Code: 46.0491

Unit	Title	Hours
Unit 1:	Orientation Review	10
Unit 2:	Basic Safety (Review and Reinforcement)	15
Unit 3:	Advanced Carpentry	95
Unit 4:	Advanced Electrical Wiring	25
Unit 5:	Advanced Masonry	40
Unit 6:	Advanced Plumbing	20

Building Trades I**Unit 1: Introduction and Orientation****(15 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe local program and vocational center policies and procedures.</p> <p>a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Present local program and vocational center policies and procedures. • Students will read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code, attendance, academic requirements, discipline, and transportation regulations. Students will work together in pairs. A student with a higher reading ability will team up with a student with a lower reading ability to get a better understanding of the school's program policies and procedures.^{E2, E3, E8} • Use a transparency to discuss the parts of a resume and cover letter, and provide each student a written sample.^{E3, E8} • Have each student use the Internet or newspapers to choose a job for which they are qualified and prepare a resume and cover letter that can be used to apply for the selected job.^{E1, E2, E4, E10} <p>Assessment:</p> <ul style="list-style-type: none"> • Students will have a test on applicable policies and procedures. • Students will submit a written report on rules and regulations. • Students will explain local student handbook requirements. • Exercises to identify equipment and functions found in the school lab. • Assess student orientation knowledge through teacher observations and written unit test. File completed test to document student mastery of the school and program policies and procedures.
<p>2. Describe employment opportunities and responsibilities.</p> <p>a. Describe employment opportunities including potential earnings,</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Use the Contren Series Core Text, Basic Employability Skills Unit and Carpentry Level I, Orientation to the Trade Unit to

<p>employee benefits, job availability, place of employment, working conditions, and educational requirements.</p> <p>b. Describe basic employee responsibilities.</p>	<p>define trade terms related to basic employability skills. Discuss the chapter and perform the related activities to promote awareness of employability skills.^{E2}</p> <ul style="list-style-type: none"> Students will use career software, such as Choices, to measure their aptitudes and abilities for particular careers.^{E3, E8} Students will use the Internet to research a list of careers for which they will be qualified upon program completion.^{E2, E3, E4, E5, E10} Students will use available resources (college catalogs and websites) to research information about postsecondary educational opportunities.^{E2, E3, E4, E5, E10} Students will select a career in the field and outline educational and skill requirements, expected job growth, and entry-level salaries.^{E1, E3, E8, E9} Discuss the parts of a resume, and cover letter, and/or job application. Provide each student a written sample. Have each student use the Internet or newspapers to choose a job for which they are qualified and prepare a resume and cover letter that can be used to apply for the selected job.^{E1, E2, E4, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Assessment will be determined by a matching test for definitions and the level of success regarding the Contren activities. Lessons involving writing and math skills will be integrated with the appropriate department. Use a checklist to evaluate the resume and cover letter. Review career software printout to assess student aptitudes and abilities.
<p>3. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.</p> <p>a. Demonstrate effective teambuilding and leadership skills.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the role of a team member and leader. Assign the students roles within a team and have them role play a situation in which there is a conflict which must be resolved. Utilize the lessons from

<p>b. Practice appropriate work ethics.</p>	<p>SkillsUSA, Contren Tools for Success, or other resources to provide additional training.^{E3, E8}</p> <ul style="list-style-type: none"> • Discuss appropriate work ethics standards. Have the students list what they believe to be the most common problems within the building trades profession. <p>Assessment:</p> <ul style="list-style-type: none"> • Assess the role play using a checklist for documentation. • Lessons from other resources should be assessed according to the recommended resource guide.
<p>4. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Have the students perform an activity involving verbal instructions. Divide the students into groups and have one team be the customer and the other be the contractor. The customer will describe the project and the contractor will have to provide a brief plan for the construction of the project. Have the groups switch roles and the customer will provide the contractor with a written plan and blueprint. The contractor will describe the procedure for construction of the project.^{E2, E3, E4, E8} <p>Assessment:</p> <ul style="list-style-type: none"> • The lesson will be assessed using a rubric or a checklist for the written projects and presentation.
<p>5. Discuss the history of building trades to include materials and techniques.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Utilize the Contren Carpentry Level I Orientation to the Trade Unit to discuss the history of building trades. Have the students research the history of building trades to present day and develop a short presentation on each topic. The students will present to the class.^{H1, H2} <p>Assessment:</p> <ul style="list-style-type: none"> • Assess the presentation using a checklist.

STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

- COM1 Demonstrate the ability to understand information and instructions that are presented in both written and verbal form.
- COM2 Demonstrate the ability to communicate effectively in on-the-job situations using written and verbal skills.
- EMP1 Explain the construction industry, the role of the companies that make up the industry, and the role of individual professionals in the industry.
- EMP2 Demonstrate critical thinking skills and the ability to solve problems using those skills.
- EMP3 Demonstrate knowledge of computer systems and explain common uses for computers in the construction industry.
- EMP4 Demonstrate effective relationship skills with teammates and supervisors, exhibit the ability to work on a team, and demonstrate appropriate leadership skills.
- EMP5 Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

Academic Standards

- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
- H2 Describe the impact of science and technology on the historical development of the United States in the global community.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

Suggested References

Choices [Computer software]. (n.d.). (n.d.). Ogdensburg, NY: Careerware, IMS Information Systems Management Corporation.

Davies, D. (1997). *Grammar? No problem!* Mission, KS: SkillPath.

Gould, M. C. (2002). *Developing literacy & workplace skills*. Bloomington, IN: National Education Service.

Local District Policy Handbook

National Center for Construction Education and Research. (2001). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Tools for success*. Upper Saddle River, NJ: Pearson Prentice Hall.

SkillsUSA. (2002). *Leadership and competition curricula*. Tinley Park, NY: Goodheart-Willcox.

Building Trades I
Unit 2: Basic Safety

(15 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe general safety rules for working in a shop/lab and industry.</p> <ol style="list-style-type: none"> Describe how to avoid on-site accidents. Explain the relationship between housekeeping and safety. Explain the importance of following all safety rules and company safety policies. Explain the importance of reporting all on-the-job injuries, accidents, and near misses. Explain the need for evacuation policies and the importance of following them. Explain the employer's substances abuse policy and how it relates to safety. Explain the safety procedures when working near pressurized or high temperature. 	<p>Teaching: This can be used for the entire unit.</p> <ul style="list-style-type: none"> Identify, discuss, and demonstrate terms, rules, and procedures related to shop/lab and industry safety (Contren Core Text Basic Safety Unit and Carpentry Level I Orientation to the Trade Unit).^{E3, E8} Required written tests will follow each section of guidelines for safety rules and procedures. Provide the students with a list of terms and have them define the terms. Pair the students to quiz each other on the definitions in preparation for a written exam.^{E2, E3, E4, E8} Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears). Divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline. Have an industry speaker present to the class the necessity of safety in the work environment. The students will write a summary of the presentation.^{E1, E2, E9} Divide the students into teams and have them develop scenarios of hazards and accidents using the Contren Series Core Text, Basic Safety Unit, trade publications, and the Internet. This will include tools, spills, working around welding, improper use of barriers, ladders or scaffolds, use of Material Safety Data Sheet (MSDS) information, fires, and electrical situations. In a game type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation or accident. Points will be awarded to the teams with the correct answers.^{E2, E4}
<p>2. Identify and apply safety around welding operations.</p> <ol style="list-style-type: none"> Use proper safety practices when welding or working around welding operations. Use proper safety practices when welding in or near trenches and excavations. Explain the term <i>proximity work</i>. 	
<p>3. Identify and explain use of various barriers and confinements.</p> <ol style="list-style-type: none"> Explain the safety requirements for working in confined areas. Explain and practice lockout/tagout procedures. Explain the different barriers and barricades, and how they are used. Recognize and explain personal protective equipment. Inspect and care for personal protective equipment. 	

<p>4. Explain lifting and the use of ladders and scaffolds.</p> <ol style="list-style-type: none"> Identify and explain the procedures for lifting heavy objects. Inspect and safely work with various ladders and scaffolds. 	<ul style="list-style-type: none"> Required written tests will follow each section of guidelines for safety rules and procedures. NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR. <p>Assessment:</p> <ul style="list-style-type: none"> Student participation will be monitored by the teacher and the written exam will be graded. The “do’s and don’ts” exercise will be critiqued with a peer review. The summary of the speaker’s presentation will be critiqued using a rubric. The teams will be rewarded according to the points earned from the game. This could be extra points, classroom privileges, etc. Written exams will be graded.
<p>5. Explain the Material Safety Data Sheet (MSDS).</p> <ol style="list-style-type: none"> Explain the function of the MSDS. Interpret the requirements of the MSDS. 	
<p>6. Explain fires.</p> <ol style="list-style-type: none"> Explain the process by which fires start. Explain fire prevention of various flammable liquids. Explain the classes of fire and the types of extinguishers. 	
<p>7. Explain safety in and around electrical situations.</p> <ol style="list-style-type: none"> Explain injuries when electrical contact occurs. Explain safety around electrical hazards. Explain action to take when an electrical shock occurs. 	

STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

- SAF1 Identify the responsibilities and personal characteristics of a professional craftsperson.
- SAF2 Explain the role that safety plays in the construction crafts.
- SAF3 Describe what job-site safety means.
- SAF4 Explain the appropriate safety precautions around common job-site hazards.
- SAF5 Demonstrate the use and care of appropriate personal protective equipment.
- SAF5 Follow safe procedures for lifting heavy objects.
- SAF6 Describe safe behavior on and around ladders and scaffolds.
- SAF7 Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).
- SAF8 Describe fire prevention and fire fighting techniques.
- SAF9 Define safe work procedures around electrical hazards.

Academic Standards

- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

Suggested References

Feirer, M., & Feirer, J. (2004). *Carpentry and building construction*. Chicago: Glencoe/McGraw-Hill.

National Center for Construction Education and Research. (2001). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

Wagner, W., & Smith, H. (2000). *Modern carpentry*. Tinley Park, NY: Goodheart-Willcox.

Building Trades I
Unit 3: Basic Math

(15 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Apply the four basic math skills with whole numbers, fractions, and percent.</p> <ol style="list-style-type: none"> Add, subtract, multiply, and divide whole numbers, decimals, and fractions. Convert whole numbers to fractions, and convert fractions to whole numbers. Convert decimals to percent, and convert percent to decimals. Convert fractions to decimals. Convert fractions to percent. 	<p>Teaching:</p> <ul style="list-style-type: none"> Have students complete a short pretest to apply the four basic math skills with whole numbers, fractions, and percent (may use Contren Core Text, Basic Math Unit).^{A1, A5} Give students the correct answers to problems, and ask at least one student who got the answers for whole numbers correct to write the problems on the chalkboard or a piece of chart paper. Have students who did not get the problems correct listen as the student at the board or paper works the problems. Do this procedure for fractions and percent as well, having students rotate through the skills until each student has spent time with each set of problems. Have a different student lead the discussion each time students rotate so that the students who are just learning how to work the problems have a chance to teach the other students.^{E2, E4, E5} Provide students with additional problems to apply the four basic math skills with whole numbers, fractions, and percent while working in small groups and then alone.^{A1, A5} <p>Assessment:</p> <ul style="list-style-type: none"> Monitor group work as students perform calculations. Evaluate students on a posttest with whole number, fraction, and percent problems.
<p>2. Use the metric system.</p> <ol style="list-style-type: none"> Use a standard and metric ruler to measure. Explain what the metric system is and its importance. Recognize and use metric units of length, weight, volume, and temperature. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the metric system and its importance. Divide students into groups and have them design a small building project appropriate for the program, including dimensions in standard and metric measurements.^{A1} Have students use stiff paper (or materials in the shop) to build a simple model, measuring the pieces using both standard

	<p>and metric rulers to ensure that the model is to proper scale with the design.^{A2}</p> <ul style="list-style-type: none"> • Distribute a variety of metric measuring tools for length, weight, volume, and temperature. Have students measure assigned materials using the appropriate tools and record the measurements.^{A2} • Have each student write or type (if technology resources are available) a paper comparing the use of the standard and metric systems and proposing why the United States should or should not use the metric system.^{E1, E9, E10} <p>Assessment:</p> <ul style="list-style-type: none"> • Compare design specifications to the constructed model to ensure that measurements are correct. • Evaluate each student's measurements for accuracy. • Evaluate each student's paper for content as well as grammar and organization.
<p>3. Apply basic mathematics for building trades.</p> <ol style="list-style-type: none"> a. Solve basic algebraic equations. b. Calculate area and volume of simple geometric figures. c. Apply basic math to solve simple geometric figures and problems. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss and demonstrate the basic mathematic applications in building trades.^{A1, A3, A5} • Have students apply the applications in solving real work related problems using the Contren Carpentry Level I Roof Framing Unit or other materials.^{A1, A3, A5} <p>Assessment:</p> <ul style="list-style-type: none"> • Assessment of the problems will be Contren examinations and performance examinations.

STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

MAT1 Add, subtract, multiply, and divide whole numbers, with and without a calculator.

MAT2 Use a standard ruler and a metric ruler to measure.

MAT3 Add, subtract, multiply, and divide fractions.

MAT4 Add, subtract, multiply, and divide decimals, with and without a calculator.

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- MAT5 Convert decimals to percents and percents to decimals.
- MAT6 Convert fractions to decimals and decimals to fractions.
- MAT7 Explain what the metric system is and how it is important in the construction trade.
- MAT8 Recognize and use metric units of length, weight, volume, and temperature.
- MAT9 Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

Level I

- ICM1 Add, subtract, multiply, and divide whole numbers, with and without a calculator.
- ICM2 Use a standard ruler and a metric ruler to measure.
- ICM3 Add, subtract, multiply, and divide fractions.
- ICM4 Add, subtract, multiply, and divide decimals, with and without a calculator.
- ICM5 Convert decimals to percents and percents to decimals.
- ICM6 Convert fractions to decimals and decimals to fractions.
- ICM7 Explain what the metric system is and how it is important in the construction trade.
- ICM8 Recognize and use metric units of length, weight, volume, and temperature.
- ICM9 Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5 Utilize various formulas in problem-solving situations.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T6 Technology problem-solving and decision-making tools

Suggested References

- Barrows, R., & Jones, B. (2002). *Fundamentals of math with career applications*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Boyce, J. G., Margolis, L., & Slade, S. (2000). *Mathematics for technical and vocational students*. Upper Saddle River, NJ: Prentice Hall.
- Carman, R. A., & Saunders, H. M. (2005). *Mathematics for the trades: A guided approach*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Cook, N. P. (2004). *Introductory mathematics*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Cook, N. P. (2004). *Mathematics for technical trades*. Upper Saddle River, NJ: Pearson Prentice Hall.
- National Center for Construction Education and Research. (2004). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.
- National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Webster, A., & Judy, K. B. (2002.) *Mathematics for carpentry and the construction trades*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades I**Unit 4: Hand and Power Tools****(20 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Demonstrate the use and maintenance of hand and power tools.</p> <ol style="list-style-type: none"> Identify and discuss the use of common hand and power tools. Discuss rules of safety. Select and demonstrate the use of tools. Explain the procedures for maintenance. 	<p>Teaching:</p> <ul style="list-style-type: none"> Identify basic hand and power tools (e.g., hammer, screwdriver, saw, wrench, pliers, drill) used in the field (Contren Core Text Introduction to Hand Tools and Introduction to Power Tools Units and Carpentry Level I Hand and Power Tools Unit) and how they have advanced through time.^{E3, E8, H2} Discuss safety factors, proper use, and maintenance.^{E2, E5} Describe accidents that can occur while using tools. Divide students into groups and give each group a scenario or case study (written or on video) involving an accident. Have each group identify safety mistakes in each situation; determine correct procedures; and present the scenario, mistakes found, and procedures which should have been used to the class.^{E2, E3, E4, E5, E9, E10} Demonstrate the uses of various hand and power tools for the class. Provide each student with a description of a project to be completed. Have the student select the appropriate tool for the project and demonstrate its proper use to the class.^{E2, E3, E4, E5, E9, E10} Assign each student a specific set of tools (i.e., hammers, power saws, wrenches, etc.). Have students use the Internet to research and write or type (if technology resources are available) a report on the proper procedures for maintenance of the assigned set of tools.^{E1, E3, E4, E5, E9, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Have each student complete a test to identify specific tools. Evaluate the case study presentation for content and delivery.

	<ul style="list-style-type: none"> • Evaluate the selection of the proper tool for the assigned project and demonstration of its use. • Evaluate the maintenance report using a rubric or checklist.
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STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

HTO1 Recognize and identify some of the basic hand tools used in the construction trade.

HTO2 Use these tools safely.

HTO3 Describe the basic procedures for taking care of these tools.

PTO1 Identify commonly used power tools of the construction trade.

PTO2 Use power tools safely.

PTO3 Explain how to maintain power tools properly.

Level I

HPT1 Identify the hand tools commonly used by carpenters and describe their uses.

HPT2 Use hand tools in a safe and appropriate manner.

HPT3 State the general safety rules for operating all power tools, regardless of type.

HPT4 State the general rules for properly maintaining all power tools, regardless of type.

HPT5 Identify the portable power tools commonly used by carpenters and describe their uses.

HPT6 Use portable power tools in a safe and appropriate manner.

HPT7 Identify the stationary power tools commonly used by carpenters and describe their uses.

HPT8 Use stationary power tools in a safe and appropriate manner.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.

A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Suggested References

- Feirer, M., & Feirer, J. (2004). *Carpentry and building construction*. Chicago: Glencoe/McGraw-Hill.
- National Center for Construction Education and Research. (2001). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.
- National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Vogt, F. (2003). *Residential construction academy carpentry*. Clifton Park, NY: Thomson/Delmar Learning.
- Wagner, W., & Smith, H. (2000). *Modern carpentry*. Tinley Park, NY: Goodheart-Willcox.

Building Trades I**Unit 5: Introduction to Blueprints****(20 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Read, analyze, and design a blueprint.</p> <ol style="list-style-type: none"> Identify terms and symbols commonly used on blueprints. Interpret various symbols to locate various elements. Interpret a plan to determine layout. Interpret basic electrical specifications. Interpret electrical drawings, including site plans, floor plans, and detail drawings. Read equipment schedule. Explain basic layout of a blueprint. Describe the information in a title block. Identify the lines used on blueprints. Explain the architect's and engineer's scales. Design a blueprint. Construct a structure based on a blueprint. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using a blueprint (may use AutoCAD if available), explain all terms, symbols, and abbreviations on the blueprint and how they are used to locate various elements. Give each student a copy of the symbols and abbreviations (Contren Core Text Introduction to Blueprints Unit). Discuss electrical specifications and drawings, equipment schedules, blueprint components, and architect's and engineer's scales.^{E3, E8} Divide students into pairs and have them quiz each other on the terms and symbols. Have each student interpret a plan, electrical specifications, and electrical drawings; match them to an actual picture of the area; and interpret the information to the class.^{E2, E4, E9} Have students work as a team to prepare a blueprint of a corner of the classroom to present to a client (Contren Core Text Introduction to Blueprints Unit). Have students type a letter or report to the client and prepare blueprints including symbols, electrical specifications and drawings, equipment schedule, title block, lines, and scales for the client.^{E1, E4, E5, E9} Have students contact a building store manager (may simulate a call) or review advertisements on the Internet to determine the procedure for purchase of the materials and the estimated cost. Have students include an estimated cost of material in the information sent to the client in the activity above.^{A1, A5, E9, E10} To determine the accuracy of the blueprint, have students complete a project according to the blueprint specifications (Contren Core Text Introduction to Blueprints Unit).^{A1, A5, E10}

	<p>Assessment:</p> <ul style="list-style-type: none"> • Monitor group work as students quiz each other, and use a checksheet of symbols to monitor student success (Contren Core Text Introduction to Blueprints Unit). • Determine if each student matches the plan to the correct picture, and evaluate his or her interpretation of the information to the class for accuracy, clarity, and presentation skills. • Review the blueprint for accuracy, and grade the letter or report for accuracy of content, grammar, and organization. • Evaluate the equipment schedule and estimated cost of materials for cost effectiveness. • Evaluate the project according to a checklist or rubric from Contren Unit.
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STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

BLU1 Recognize and identify basic blueprint terms, components, and symbols.

BLU2 Relate information on blueprints to actual locations on the print.

BLU3 Recognize different classifications of drawings.

BLU4 Interpret and use drawing dimensions.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.

A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Huth, M. W., & Wells, W. (2000). *Understanding construction drawings*. Albany, NY: Delmar/Thomson Learning.

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades I**Unit 6: Materials Used in Building Trades****(16 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe wood building materials used in building trades.</p> <ol style="list-style-type: none"> Explain the terms commonly used in discussing wood and lumber. State the uses of various types of hardwoods and softwoods. Identify various types of imperfections that are found in lumber and explain the grading process of lumber and plywood. Explain how plywood is manufactured, graded, and used. Identify various types of building panels and identify their uses. Identify the uses and safety precautions associated with pressure-treated lumber. Describe the proper method of caring for lumber and wood building materials at the job site. State the uses of various types of engineered lumber. Calculate the quantities of lumber and building materials using accepted standards. (See local building codes.) 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the terms that apply to wood and lumber. Divide the students into groups to quiz each other on the terms provided.^{E3, E8} Provide handouts identifying various types of lumber and the effects of imperfections. Have the students research the uses of the types of lumber and the effects of imperfections and present the results of the research.^{E2, E3, E5} Provide a handout to describe how plywood is manufactured, graded, and used. Perform activity to show examples of plywood and have them explain the grading process (Contren Level I, Wood Building Materials Fasteners and Adhesives Unit).^{E3, E8} Provide students with samples of panels and have them identify and state their uses. Provide students with an MSDS related to safety precautions dealing with pressure treated lumber. Have them use the MSDS to identify safety hazards associated with pressure-treated lumber.^{E1, E3, E5} Demonstrate the proper methods for sorting and stacking building materials. Have students perform the proper methods. Provide students with a handout and have them identify the various types of engineered lumber and their applications (Contren Level I, Wood Building Materials Fasteners and Adhesives Unit).^{E3, E8} Explain the procedures for calculating lumber and building materials for a given job. Provide the students with a scenario and have them perform the calculation. <p>Assessment:</p> <ul style="list-style-type: none"> Assess with written quiz. Assess with a rubric or checklist. Assess according to the materials provided

	<p>in the Contren materials.</p> <ul style="list-style-type: none"> • Assess by correctness of the matching activity. • Assess using a checklist. • Assess using a performance checklist. • Assess according to the materials provided in the Contren materials. • Assess according to the correctness of the calculation.
2. Describe wood building fasteners and adhesives used in the construction industry.	<p>Teaching:</p> <ul style="list-style-type: none"> • Using the Contren Level I, Wood Building Materials Fasteners and Adhesives Unit, discuss the various fasteners and adhesives and have the students perform the appropriate activities identifying the various fasteners and adhesives.^{A1, A2, A5} <p>Assessment:</p> <ul style="list-style-type: none"> • Assess according to the materials provided in the Contren materials.

STANDARDS

Contren Learning Series Best Practices

Level I

WBM1	Explain the terms commonly used in discussing wood and lumber.
WBM2	State the uses of various types of hardwoods and softwoods.
WBM3	Identify various types of imperfections that are found in lumber.
WBM4	Explain how lumber is graded.
WBM5	Interpret grade markings on lumber and plywood.
WBM6	Explain how plywood is manufactured, graded, and used.
WBM7	Identify various types of building boards and identify their uses.
WBM8	Identify the uses of and safety precautions associated with pressure-treated and fire-retardant lumber.
WBM9	Describe the proper method of caring for lumber and wood building materials at the job site.
WBM10	State the uses of various types of engineered lumber.
WBM11	Calculate the quantities of lumber and wood products using industry-standard methods.
WBM12	List the basic nail and staple types and their uses.
WBM13	List the basic types of screws and their uses.
WBM14	Identify the different types of anchors and their uses.
WBM15	Describe the common types of adhesives used in construction work and explain their uses.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Feirer, M., & Feirer, J. (2004). *Carpentry and building construction*. Chicago: Glencoe/McGraw-Hill.

National Center for Construction Education and Research. (2001). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Vogt, F. (2003). *Residential construction academy carpentry*. Clifton Park, NY: Thomson/Delmar Learning.

Wagner, W., & Smith, H. (2000). *Modern carpentry*. Tinley Park, NY: Goodheart-Willcox.

Building Trades I
Unit 7: Basic Rigging

(10 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain and identify safe rigging and equipment.</p> <ol style="list-style-type: none"> Explain and practice safe rigging. Identify and explain rigging equipment. Inspect rigging equipment. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using industry pictures of safe rigging from Contren Core Text Basic Rigging Unit, trade publications, and overheads of rigging equipment, identify, inspect and explain the techniques of safe rigging.^{E1} Students will be given scale models of rigging equipment and will practice the rigging process. Take students on a field trip to a local industry to observe rigging procedures. Students will be divided into groups, take pictures of rigging, and write or type an individual report describing their pictures, and present their report to the class.^{E1, E2, E5} <p>Assessment:</p> <ul style="list-style-type: none"> Monitor the students as they quiz each other while working with the scale models. Teacher will monitor the students at the field trip site and industry personnel will provide instruction on proper rigging techniques. The written report, picture, and presentation will be graded on content and delivery.
<p>2. Discuss the proper use of load-handling and signaling practices.</p> <ol style="list-style-type: none"> Discuss the proper procedures for estimating size, weight, and center of gravity. Simulate rigging and moving materials and equipment. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss procedures for handling a load. Provide the proper hand signals for moving the load. Provide the correct procedures to move rig and move materials and equipment. Utilize activities in Contren Core Text Basic Rigging Unit.^{A1, E3, E8} <p>Assessment:</p> <ul style="list-style-type: none"> Assess the discussion using teacher observation to monitor the activity. Assess the Contren activities from the materials provided.

STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

- RIG1 Identify and describe the use of slings and common rigging hardware.
RIG2 Describe the basic inspection techniques and rejection criteria used for slings and hardware.
RIG3 Describe the basic hitch configurations and their proper connections.
RIG4 Describe basic load-handling safety practices.
RIG5 Demonstrate proper use of American National Standards Institute (ANSI) hand signals.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.

- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T6 Technology problem-solving and decision-making tools

Suggested References

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades I**Unit 8: Introduction to Carpentry****(40 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain the fundamentals of the carpentry trade.</p> <ol style="list-style-type: none"> Review the history of the carpentry trade. Describe modern carpentry. Describe career ladders and advancement possibilities in masonry work. Describe the skills, attitudes, and abilities needed to work as a carpenter. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using the Contren Carpentry Level I, Orientation to the Trade Unit, discuss the fundamentals of carpentry to include a review of history, modern materials and methods, career opportunities, and workplace skills.^{E2, H1, H2, H3, H4} Using the Internet, have students work in teams/groups to complete a written report contrasting the history of carpentry with modern carpentry to include materials and methods. Have students present the report to the class.^{E1, E2, E3, E4, E7, E8, E9, H1, H2, H3, H4} Using the Career Center, have students investigate career opportunities in the carpentry field to include occupational outlook, wages, and working conditions. Have students write a report on the field.^{A8, E1, E2, E3, E4, E5, E10} Have students develop a list of the most common employee problems.^{E1, E2, E3, E4, E5, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Use the written report rubric and the presentation rubric to evaluate the student's report and presentation. Use the written report rubric to evaluate the group report. Use a checklist to evaluate the list.
<p>2. Identify and define terms used in the carpentry trade.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Using the Contren Carpentry Level I, Orientation to the Trade Unit, provide students with a list of terms, types, and definitions relating to carpentry. The students should be able to apply the terms by labeling and/or defining parts of a given foundation.^{E1, E3, E8} <p>Assessment:</p> <ul style="list-style-type: none"> Assess the activity by using the label or definition checklist.

<p>3. Demonstrate safety when working in carpentry.</p> <ol style="list-style-type: none"> Demonstrate safe working procedures related to carpentry. Identify hazards related to carpentry and how to avoid or minimize them in the workplace. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using the Contren Carpentry Level I, Orientation to the Trade Unit, discuss safety factors regarding carpentry.^{E2, E3} Divide students into groups and give each group a scenario/case study involving an accident. Have each group identify safety mistakes in each situation; determine the correct procedures; and present the scenario, mistakes found, and procedures which should have been used to correct the problem.^{E2, E3, E4, E7, E8, E9, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the case study using a rubric.
<p>4. Review and discuss materials used in carpentry.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Using the Contren Carpentry Level I, Orientation to the Trade Unit, discuss the types of materials related to carpentry. Provide the students with a project specification. They will identify the materials necessary to complete the project.^{E2, E3, E8, E10} <p>Assessment:</p> <ul style="list-style-type: none"> The project will be assessed using a rubric or checklist.
<p>5. Review and discuss tools used in carpentry trades.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Using the Contren Carpentry Level I, Hand and Power Tools Unit, discuss and demonstrate the uses of various carpentry tools for the class.^{E2, E7, E10} Provide each student with a description of a project to be completed. Have the student select the appropriate tool for the project and demonstrate its proper use to the class.^{E2, E3, E8, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the selection of the proper tool for the assigned project and demonstration of its use.

STANDARDS

Contren Learning Series Best Practices

Level I

Core Curriculum Best Practices

- SAF1 Identify the responsibilities and personal characteristics of a professional craftsperson.
- SAF2 Explain the role that safety plays in the construction crafts.
- SAF3 Describe what job-site safety means.
- SAF4 Explain the appropriate safety precautions around common job-site hazards.
- SAF5 Demonstrate the use and care of appropriate personal protective equipment.
- SAF5 Follow safe procedures for lifting heavy objects.
- SAF6 Describe safe behavior on and around ladders and scaffolds.
- SAF7 Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).
- SAF8 Describe fire prevention and fire fighting techniques.
- SAF9 Define safe work procedures around electrical hazards.

Hand and Power Tools

- HPT1 Identify the hand tools commonly used by carpenters and describe their uses.
- HPT2 Use hand tools in a safe and appropriate manner.
- HPT3 State the general safety rules for operating all power tools, regardless of type.
- HPT4 State the general rules for properly maintaining all power tools, regardless of type.
- HPT5 Identify the portable power tools commonly used by carpenters and describe their uses.
- HPT6 Use portable power tools in a safe and appropriate manner.
- HPT7 Identify the stationary power tools commonly used by carpenters and describe their uses.
- HPT8 Use stationary power tools in a safe and appropriate manner.

Academic Standards

- A8 Analyze data and apply concepts of probability.
- E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.
- H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
- H2 Describe the impact of science and technology on the historical development of the United States in the global community.
- H3 Describe the relationship of people, places, and environments through time. civic responsibilities.
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Feirer, M., & Feirer, J. (2004). *Carpentry and building construction*. Chicago: Glencoe/McGraw-Hill.

National Center for Construction Education and Research. (2004). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Tools for success*. Upper Saddle River, NJ: Pearson Prentice Hall.

Vogt, F. (2003). *Residential construction academy carpentry*. Clifton Park, NY: Thomson/Delmar Learning.

Wagner, W., & Smith, H. (2000). *Modern carpentry*. Tinley Park, NY: Goodheart-Willcox.

Building Trades I**Unit 9: Introduction to Electrical Wiring****(20 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Demonstrate safety in and around electrical circuits and equipment.</p> <ol style="list-style-type: none"> Demonstrate safe working procedures in a construction environment. Explain the purpose of OSHA and how it promotes safety on-the-job. Identify electrical hazards and how to avoid or minimize them in the workplace. Explain safety issues concerning lockout/tagout. 	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I, Electrical Safety Unit to discuss the safe working procedures. Have the students discuss the material and perform the activities provided. ^{E2, E3, E5, E8} Discuss OSHA and its relationship to job safety. Using the Internet and other resources, divide the students into groups to research OSHA regulations relating to an assigned job and develop a presentation. ^{E1, E2, E3, E5, E8, E10} Utilize the Contren Construction Technology Volume I, Electrical Safety Unit to discuss the safe working procedures. Have the students discuss the material and perform the activities provided. ^{E2, E3, E5, E8} Discuss lockout/tagout safety issues. Have the students simulate the procedures for lockout/tagout. <p>Assessment:</p> <ul style="list-style-type: none"> The assessments for the activities are provided in the Contren Construction Technology Volume I, Instructors Guide. The presentation will be assessed using a presentation rubric or checklist. The assessments for the activities are provided in the Contren Construction Technology Volume I, Instructors Guide. Assess the simulation using a procedures checklist.
<p>2. Describe/identify basic electricity.</p> <ol style="list-style-type: none"> State how electrical power is generated and distributed. Describe how voltage, current, resistant, and power are related. Explain the different types of meters used to measure voltage, current, and resistance. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the process of generating electrical power from origin to actual usage. Utilize a chart, diagram, or flow chart to trace the generation of power from the atom to the power plant to industrial buildings and residential areas. Students will be able to trace this process by labeling an example

<p>d. Use Ohm's Law to calculate the current, voltage, and resistance in a circuit.</p> <p>e. Calculate how much power is consumed by a circuit using the power formula.</p> <p>f. Describe the differences between series and parallel circuits.</p>	<p>of the process. ^{E2, E3, E5, E8}</p> <ul style="list-style-type: none"> Using Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit or other resources, define and discuss the terms related to electricity. The students will match terms with the definitions. ^{E2, E3, E8, E10} Using Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit, discuss and demonstrate the various types of meters and their uses. Students will be given a specific reading and must identify the correct meter and record the correct reading. ^{E2, E3, E8, E10} Given the formula for Ohm's Law, the students will calculate current, resistance, and voltage. ^{A1, A3, A5} Given the power equation, students will perform calculations to find the power consumed in a circuit or load. ^{A1, A3, A5} Using Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit, discuss the difference between a series circuit and a parallel circuit. The students should be able to draw a diagram of a series/parallel circuit. ^{E2, E3, E8, E10} <p>Assessment:</p> <ul style="list-style-type: none"> The labeling exercise will be assessed by using a checksheet. The matching activity will be assessed with an answer key. Assessment of the activity will use an identification checklist and reading chart. The problems will be assessed with an answer key. The problems will be assessed with an answer key. The diagram will be assessed using rubric or checklist.
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STANDARDS*Contren Learning Series Best Practices*

Level I

Electrical Safety

- ELS1 Demonstrate safe working procedures in a construction environment.
- ELS2 Explain the purpose of OSHA and how it promotes safety on-the-job.
- ELS3 Identify electrical hazards and how to avoid or minimize them in the workplace.
- ELS4 Explain safety issues concerning lockout/tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems.

Electrical Theory One

- ETO1 Recognize what atoms are and how they are constructed.
- ETO2 Define voltage and identify the ways in which it can be produced.
- ETO3 Explain the difference between conductors and insulators.
- ETO4 Define the units of measurement that are used to measure the properties of electricity.
- ETO5 Explain how voltage, current, and resistance are related to each other.
- ETO6 Using the formula for Ohm's Law, calculate an unknown value.
- ETO7 Explain the different types of meters used to measure voltage, current, and resistance.
- ETO8 Using the power formula, calculate the amount of power used by a circuit.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T4 Technology communications tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Holzman, H. (1996). *Residential wiring*. Tinley, Park IL: Goodheart-Willcox.

Kibbe, R. (2002). *Mechanical systems for industrial maintenance*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2002). *Construction technology volume I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades I**Unit 10: Introduction to Masonry****(30 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain the fundamentals of the masonry trade.</p> <ol style="list-style-type: none"> Review the history of masonry. Describe modern masonry materials and methods. Describe career ladders and advancement possibilities in masonry work. Describe the skills, attitudes, and abilities needed to work as a mason. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the fundamentals of masonry to include a review of history, modern materials and methods, career opportunities, and workplace skills.^{E2, H1, H2, H3, H4} Using the Internet, have students work in teams/groups to complete a written report contrasting the history of masonry with modern masonry to include materials and methods. Have students present the report to the class.^{E1, E2, E3, E4, E7, E8, E9, H1, H2, H3, H4} Using the Career Center, have students investigate career opportunities in the field of masonry to include occupational outlook, wages, and working conditions. Have students write a report on the field.^{A8, E1, E2, E3, E4, E5, E10} Have students develop a list of the most common employee problems.^{E1, E2, E3, E4, E5, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the student's report and presentation for content, organization, grammar, and spelling. Evaluate the group report for participation, content, organization, grammar, and spelling. Use a checklist to evaluate the list.
<p>2. Explain and define terms and materials associated with masonry.</p> <ol style="list-style-type: none"> Name the different types of brick, block, and stone. Label parts of a brick, block, and stone. Identify the positions as they appear in a wall. Identify the materials used in the masonry trade. 	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to provide terms, definitions, and examples of brick, block, and stone. Discuss the terms and materials in class.^{E2, E3, E8, E10} Have the students research, from text, handouts, and Internet, the types, parts, and positions of brick, block, and stone.^{E3} Divide the students into groups and have them develop working projects using

	<p>actual materials.^{E1, E3, E5, E8, E9}</p> <p>Assessment:</p> <ul style="list-style-type: none"> • Monitor student mastery by observing groups. • Assess the project using a rubric to judge the accuracy of the project.
<p>3. Identify and discuss safety issues in and around the masonry worksite.</p> <ol style="list-style-type: none"> a. Identify hazards related to masonry and how to avoid or minimize them in the workplace. b. Identify and describe the safe use of tools and equipment used in performing masonry tasks. c. Demonstrate safe working procedures related to masonry. d. Demonstrate the correct procedure for assembling and disassembling scaffolding according to federal safety regulations. e. Perform safety and mechanical checks on a mechanical mixer. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to discuss safety factors and hazards in the field of masonry.^{E2, E3} • Divide students into groups and give each group a scenario/case study involving an accident. Have each group identify safety mistakes in each situation; determine the correct procedures; and present the scenario, mistakes found, and procedures which should have been used to correct the problem.^{E1, E3, E5, E8, E9} • Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to demonstrate the uses of various hand and power tools for the class. • Provide each student with a description of a project to be completed. Have the student select, demonstrate, and discuss and present the proper use of the appropriate tool to the entire class.^{E2, E3, E4, E5, E9, E10} • Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to discuss and demonstrate the correct procedure for assembling and disassembling scaffolding. Include the federal safety regulations.^{E2, E3} • Have students demonstrate the correct procedure for assembling and disassembling scaffolding according to federal safety regulations.^{E2, E3, E4, E5, E9, E10} • Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to discuss and demonstrate safety and mechanical checks on a mixer.^{E2, E3}

	<ul style="list-style-type: none"> Have students demonstrate the safe use of a mixer.^{E2, E3, E4, E5, E9, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the group activities for participation and accuracy of content. Evaluate the demonstrations based on accuracy of procedures.
<p>4. Perform procedures used in masonry trades.</p> <ol style="list-style-type: none"> Identify the positions of masonry units as they appear in a wall. Measure, mark, and cut brick and block to specifications. Lay out a brick and/or block wall using the dry bond method. Mix a batch of mortar. Lay a wall between established leads. 	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to identify and describe the positions of masonry units as they appear in a wall.^{E2, E3} Using a wall, have students describe and identify the positions.^{A1, A2, A5, E2, E3, E4} Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to discuss and demonstrate measuring, marking, and cutting brick and block to specification. Discuss the importance of accuracy as related to cost.^{E2, E3} Provide the students with specifications and have them demonstrate measuring, marking, and cutting brick and block to specification.^{A1, A2, A5, E2, E3, E4} Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to discuss and demonstrate the procedures for laying out a brick or block wall using the dry bond method.^{E2, E3} Have the students identify the materials, tools, and equipment required to lay out a wall using the dry bond method. Have them lay the wall out.^{A1, A2, A5, E2, E3, E4} Utilize the Contren Construction Technology Volume I Masonry Units and Installation Techniques Unit to discuss and demonstrate procedures for mixing mortar.^{E2, E3} Have students mix a batch of mortar.^{A1, A2, A5, E2, E3, E4} Utilize the Contren Construction Technology Volume I Masonry Units and

	<p>Installation Techniques Unit to discuss and demonstrate the procedures for laying a wall between established leads.^{E2, E3}</p> <ul style="list-style-type: none"> Have the students lay a wall between established leads.^{A1, A2, A5, E2, E3, E4} <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate students on positions of the wall by using a written test with a diagram of a wall. Evaluate student demonstrations for accuracy of procedures.
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STANDARDS

Contren Learning Series Best Practices

Level I

Masonry Units and Installation Techniques

- MIT1 Describe the most common types of masonry units.
- MIT2 Describe and demonstrate setting up a wall.
- MIT3 Lay a dry bond.
- MIT4 Spread a furrowed bed joint and butter masonry units.
- MIT5 Describe the different types of masonry bonds.
- MIT6 Cut brick and block accurately.
- MIT7 Lay masonry units in a true course.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A5 Utilize various formulas in problem-solving situations.
- A8 Analyze data and apply concepts of probability.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T5 Technology research tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Kreh, R. T. (2003). *Masonry skills*. Clifton Park, NY: Thomson/Delmar Learning.

National Center for Construction Education and Research. (2002). *Construction technology volume I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades I**Unit 11: Introduction to Plumbing****(20 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe the fundamentals of the plumbing trade.</p> <ol style="list-style-type: none"> Described the historical development of the plumbing trade. Describe the importance of plumbers in modern society and career opportunities available. Describe the functions of water supply and sewage treatment systems. Explain how the water supply and sewage treatment facilities function. Relate the development of plumbing to improvement in public health. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the fundamentals and importance of plumbing to include a review of history, modern materials and methods, career opportunities, and workplace skills.^{E2, H1, H2, H3, H4} Using the Internet, have students work in teams/groups to complete a written report contrasting the history of plumbing with modern plumbing to include materials and methods. Have students include the importance of plumbers in modern society. Have students present the report to the class.^{E1, E2, E3, E4, E7, E8, E9, H1, H2, H3, H4} Using the Career Center, have students investigate career opportunities in the field of plumbing to include occupational outlook, wages, and working conditions. Have students write a report on the field.^{A8, E1, E2, E3, E4, E5, E10} Utilize the Contren Construction Technology Volume I Plumbing Level I Unit to discuss and describe the functions of water supply and sewage treatment systems and how these facilities work. Discuss public health as it relates to the water supply.^{H2, H3} Take students on a field trip to the local water supply and sewage treatment facility. Have guest speakers on site to discuss the functions of the local facility and how water safety is protected.^{E1, E2, E3, E4, E5, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the group report for participation, content, organization, grammar, and spelling Evaluate the student report for content, organization, grammar, and spelling. Evaluate the field trip for participation and questions asked of guest speakers.

<p>2. Identify and discuss materials used in plumbing trades.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I Plumbing Level I Unit to discuss the types and sizes of pipe and fittings and relate each type to its specific application. Provide the students with a project specification. They will identify the pipe necessary to complete the project according to type, size, and fitting needed. E2, E3, E8, E10 <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the project for accuracy of pipe selection.
<p>3. Identify and discuss tools used in plumbing trades.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I Plumbing Level I Unit to demonstrate the uses of various plumbing tools for the class. E2, E3 Provide each student with a description of a project to be completed. Have the student select the appropriate tool for the project and demonstrate its proper use to the class. E2, E3, E8, E10 <p>Assessment:</p> <ul style="list-style-type: none"> Evaluate the selection of the proper tool for the assigned project and demonstration of its use.
<p>4. Perform a basic plumbing operation.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I Plumbing Level I Unit to discuss and demonstrate basic plumbing operations to include selecting materials (i.e., copper, PVC, steel), preparing the materials (i.e., threading, reaming and cutting, sweating), and performing a specified job. E2, E3 Provide the students with job specifications and have them select the proper materials, prepare the materials and fittings, and simulate performing the job. E2, E3, E8, E10

	Assessment: <ul style="list-style-type: none"> The job will be assessed by teacher observation and a performance evaluation.
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STANDARDS

Contren Learning Series Best Practices

Level I

Plastic Pipe and Fittings

- PPF1 Identify the common types of materials and schedules of plastic piping.
- PPF2 Identify the common types of fittings and valves used with plastic piping.
- PPF3 Identify and determine the kinds of hangers and supports needed for plastic piping.
- PPF4 Identify the various techniques used in hanging and supporting plastic piping.
- PPF5 Demonstrate the ability to properly measure, cut, and join plastic piping.
- PPF6 Follow basic safety precautions for the installation, operation, and maintenance of plastic tubing.
- PPF7 Identify the hazards and safety precautions associated with plastic piping.

Copper Pipe and Fittings

- CPF1 Identify the common types of materials and schedules used with copper piping.
- CPF2 Identify the common types of fittings and valves used with copper piping.
- CPF3 Identify the techniques used in hanging and supporting copper piping.
- CPF4 Demonstrate the ability to properly measure, units. ream, cut, and join copper piping.
- CPF5 Identify the hazards and safety precautions

Introduction to Drain, Waste, and Vent (DWV) Systems

- DWV1 Explain how waste moves from a fixture through the drain system to the environment.
- DWV2 Identify the major components of a drainage system and describe their functions.
- DWV3 Identify types and parts of traps and explain the importance of traps, and how traps lose their seals.
- DWV4 Identify the various types of DWV fittings and describe their applications.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T4 Technology communications tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Kibbe, R. (2002). *Mechanical systems for industrial maintenance*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2002). *Construction technology volume I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades II**Unit 1: Orientation Review****(10 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Review local program and vocational center policies and procedures.</p> <p>a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Present local program and vocational center policies and procedures. • Students will read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code, attendance, academic requirements, discipline, and transportation regulations. Students will work together in pairs. A student with a higher reading ability will team up with a student with a lower reading ability to get a better understanding of the school's program policies and procedures.^{E1, E2, E3, E4, E8, E9, E10} • Have students submit a written report on rules and regulations. <p>Assessment:</p> <ul style="list-style-type: none"> • Students will have a test on applicable policies and procedures. • Evaluate the written report on rules and regulations for content and grammar. • Assess student orientation knowledge through teacher observations and written unit test. File completed test to document student mastery of the school and program policies and procedures.
<p>2. Review employment opportunities and responsibilities.</p> <p>a. Describe employment opportunities including potential earnings, employee benefits, job availability, place of employment, working conditions, and educational requirements.</p> <p>b. Describe basic employee responsibilities.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Use the Contren Series Core Text, Basic Employability Skills Unit and the Carpentry Level I, Orientation to the Trade Unit to define trade terms related to basic employability skills. Discuss the chapter and perform the related activities to promote awareness of employability skills.^{E2} • Students will use career software, such as Choices, to measure their aptitudes and abilities for particular careers.^{E3, E8} • Students will use the Internet to research a list of careers for which they will be

	<p>qualified upon program completion.^{E2, E3, E4, E5, E10}</p> <ul style="list-style-type: none"> Students will use available resources (college catalogs and college websites) to research information about postsecondary educational opportunities.^{E2, E3, E4, E5, E10} Students will select a career in the field and outline educational and skill requirements, expected job growth, and entry-level salaries.^{E1, E3, E8, E9} Use a transparency to discuss the parts of a resume and cover letter, and provide each student a written sample.^{E3, E8} Have each student use the Internet or newspapers to choose a job for which they are qualified and prepare a resume and cover letter that can be used to apply for the selected job.^{E1, E2, E4, E10} <p>Assessment:</p> <ul style="list-style-type: none"> Assessment will be determined by matching test for definitions and the level of success regarding the Contren activities. Lessons involving writing and math skills will be integrated with the appropriate department. Use a checklist to evaluate the resume and cover letter. Review career software printout to assess student aptitudes and abilities.
<p>3. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.</p> <ol style="list-style-type: none"> Demonstrate effective teambuilding and leadership skills. Practice appropriate work ethics. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the role of a team member and leader. Assign the students roles within a team and have them role play a situation in which there is a conflict which must be resolved. Utilize the lessons from SkillsUSA, Contren Tools for Success, or other resources to provide additional training.^{E3, E8} Discuss appropriate work ethics standards. Have the students list what they believe to be the most common problems within the building trades profession. <p>Assessment:</p> <ul style="list-style-type: none"> Assess the role play using a checklist for

	<p>documentation.</p> <ul style="list-style-type: none"> Lessons from other resources should be assessed according to the recommended resource guide.
4. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.	<p>Teaching:</p> <ul style="list-style-type: none"> Have the students perform an activity involving verbal instructions. Divide the students into groups and have one team be the customer and the other be the contractor. The customer will describe the project and the contractor will have to provide a brief plan for the construction of the project. Have the groups switch roles and the customer will provide the contractor with a written plan and blueprint. The contractor will describe the procedure for construction of the project.^{E2, E3, E4, E8} <p>Assessment:</p> <ul style="list-style-type: none"> The lesson will be assessed using a rubric or a checklist for the written projects and presentation.

STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

COM1 Demonstrate the ability to understand information and instructions that are presented in both written and verbal form.

COM2 Demonstrate the ability to communicate effectively in on-the-job situations using written and verbal skills.

EMP1 Explain the construction industry, the role of the companies that make up the industry, and the role of individual professionals in the industry.

EMP2 Demonstrate critical thinking skills and the ability to solve problems using those skills.

EMP3 Demonstrate knowledge of computer systems and explain common uses for computers in the construction industry.

EMP4 Demonstrate effective relationship skills with teammates and supervisors, exhibit the ability to work on a team, and demonstrate appropriate leadership skills.

EMP5 Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

Academic Standards

- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

Suggested References

Choices [Computer software]. Ogdensburg, NY: Careerware, IMS Information Systems Management.

Davies, D. (1997). *Grammar? No problem!* Mission, KS: SkillPath.

Gould, M. C. (2002). *Developing literacy & workplace skills*. Bloomington, IN: National Education Service.

Local District Policy Handbook

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Tools for success*. Upper Saddle River, NJ: Pearson Prentice Hall.

SkillsUSA. (2002). *Leadership and competition curricula*. Tinley Park, NY: Goodheart-Willcox.

Building Trades II**Unit 2: Basic Safety (Review and Reinforcement)****(15 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe general safety rules for working in a shop/lab and industry.</p> <ol style="list-style-type: none"> Describe how to avoid on-site accidents. Explain the relationship between housekeeping and safety. Explain the importance of following all safety rules and company safety policies. Explain the importance of reporting all on-the-job injuries, accidents, and near misses. Explain the need for evacuation policies and the importance of following them. Explain the employer's substances abuse policy and how it relates to safety. Explain the safety procedures when working near pressurized or high temperature. 	<p>Teaching: This can be used for the entire unit.</p> <ul style="list-style-type: none"> Identify, discuss, and demonstrate terms, rules, and procedures related to shop/lab and industry safety (Contren Core Text Basic Safety Unit and Level I Orientation to the Trade Unit).^{E3, E8} Required written tests will follow each section of guidelines for safety rules and procedures. Provide the students with a list of terms and have them define the terms. Pair the students to quiz each other on the definitions in preparation for a written exam.^{E2, E3, E8} Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eye, and ears). Divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline.^{E2} Have an industry speaker present to the class the necessity of safety in the work environment. The students will write a summary of the presentation.^{E2, E9} Divide the students into teams and have them develop scenarios of hazards and accidents using the Contren Series Core Text, Basic Safety Unit, trade publications, and the Internet. This will include tools, spills, working around welding, improper use of barriers, ladders or scaffolds, use of Material Safety Data Sheets (MSDS) information, fires, and electrical situations. In a game type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation or accident. Points will be awarded to the teams with the correct answers.^{E2, E4}
<p>2. Identify and apply safety around welding operations.</p> <ol style="list-style-type: none"> Use proper safety practices when welding or working around welding operations. Use proper safety practices when welding in or near trenches and excavations. Explain the term <i>proximity work</i>. 	
<p>3. Identify and explain use of various barriers and confinements.</p> <ol style="list-style-type: none"> Explain the safety requirements for working in confined areas. Explain and practice lockout/tagout procedures. Explain the different barriers and barricades, and how they are used. Recognize and explain personal protective equipment. Inspect and care for personal protective equipment. 	

4. Explain lifting and the use of ladders and scaffolds. a. Identify and explain the procedures for lifting heavy objects. b. Inspect and safely work with various ladders and scaffolds.	<ul style="list-style-type: none"> Required written tests will follow each section of guidelines for safety rules and procedures. NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR. <p>Assessment:</p> <ul style="list-style-type: none"> Student participation will be monitored by the teacher and the written exam will be graded. The “do’s and don’ts” exercise will be critiqued with a peer review. The summary of the speaker’s presentation will be critiqued using a rubric. The teams will be rewarded according to the points earned from the game. This could be extra points, classroom privileges, etc. Written exams will be graded.
5. Explain the Material Safety Data Sheet (MSDS). a. Explain the function of the MSDS. b. Interpret the requirements of the MSDS.	
6. Explain fires. a. Explain the process by which fires start. b. Explain fire prevention of various flammable liquids. c. Explain the classes of fire and the types of extinguishers.	
7. Explain safety in and around electrical situations. a. Explain injuries when electrical contact occurs. b. Explain safety around electrical hazards. c. Explain action to take when an electrical shock occurs.	

STANDARDS

Contren Learning Series Best Practices

Core Curriculum Best Practices

- SAF1 Identify the responsibilities and personal characteristics of a professional craftsperson.
- SAF2 Explain the role that safety plays in the construction crafts.
- SAF3 Describe what job-site safety means.
- SAF4 Explain the appropriate safety precautions around common job-site hazards.
- SAF5 Demonstrate the use and care of appropriate personal protective equipment.
- SAF5 Follow safe procedures for lifting heavy objects.
- SAF6 Describe safe behavior on and around ladders and scaffolds.
- SAF7 Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).
- SAF8 Describe fire prevention and fire fighting techniques.
- SAF9 Define safe work procedures around electrical hazards.

Academic Standards

- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

Suggested References

Feirer, M., & Feirer, J. (2004). *Carpentry and building construction*. Chicago: Glencoe/McGraw-Hill.

National Center for Construction Education and Research. (2001). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Core curriculum*. Upper Saddle River, NJ: Pearson Prentice Hall.

Wagner, W., & Smith, H. (2000). *Modern carpentry*. Tinley Park, NY: Goodheart-Willcox.

Building Trades II**Unit 3: Advanced Carpentry****(95 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Define and apply terms and types of foundations.	<p>Teaching:</p> <ul style="list-style-type: none"> Provide students with a list of terms, types, and definitions relating to foundations. The students should be able to apply the terms by labeling and/or defining parts of a given foundation.^{E1, E3, E8} <p>Assessment:</p> <ul style="list-style-type: none"> Assess the activity by using the label or definition checklist.
2. Plan a footing and/or foundation. <ol style="list-style-type: none"> Calculate the amount of materials needed for a given foundation including forms, concrete, moisture barrier, and reinforcement materials. Set up batter boards to proper elevation. Explain how building lines are established using batter boards. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the process for preparing a footing and/or foundation. Have the students calculate the materials to complete the process for preparing a given foundation.^{A1, A2} Discuss the placement and installation of batter boards. The students will participate in the set-up demonstration. Divide the students into groups and have them set up batter boards according to given specifications.^{E2, E10} <p>Assessment:</p> <ul style="list-style-type: none"> The calculation activity will be assessed according to the correct calculation process. The demonstration will be assessed according to teacher observation. The set-up of the batter board will be assessed according to a checklist.
3. Identify and plan floor systems. <ol style="list-style-type: none"> Identify the different types of framing systems. Describe floor system requirements from drawings and specifications. Identify floor and sill framing support members. Describe the methods used to fasten sills and floor framing systems to the foundation. Select the correct girder/beam size 	<p>Teaching:</p> <ul style="list-style-type: none"> Provide information containing the different types of floor framing systems (Contren Carpentry Level I, Floor Systems Unit).^{E3, E8} Provide span table to illustrate requirements for a floor system. Have students determine lumber size for a given spacing and span.^{A1, A2, A3} Describe the various floor and sill framing support members.

<p>using specific floor load and span data.</p> <ul style="list-style-type: none"> f. Describe different types of floor joists. g. Identify different types of bridging. h. Describe and explain different types of sub-flooring materials. i. Estimate the amount of material needed to frame a floor assembly. 	<ul style="list-style-type: none"> • Identify different methods used to fasten sills to a foundation. Match selected fasteners used in floor framing to their correct uses.^{E3, E8} • Have students select the correct girder/beam and joist size from a given blueprint and/or table (Contren, Carpentry Level I, Floor Systems Unit).^{E3, E8} • Have the students identify the different types of floor joists and bridging by labeling drawing. • Have students identify and install sub-floor materials. • Have the students estimate the materials needed for a floor assembly according to specifications provided.^{A1, A2, A3} <p>Assessment:</p> <ul style="list-style-type: none"> • Assess the activities according to the materials provided in the Contren materials provided. The estimations will be assessed according to the accepted standards. (See local code)
<p>4. Construct floor systems.</p> <ul style="list-style-type: none"> a. Lay out and construct a floor assembly. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Divide the students into groups. Give instructions to have the students install bridging, install joists for a cantilever floor, install a sub-floor using butt-joint plywood/oriented stranded board (OSB) panels, and install a single floor system using tongue-and-groove plywood/OSB panels (Contren, Carpentry Level I, Floor Systems Unit).^{E2, E10} <p>Assessment:</p> <ul style="list-style-type: none"> • The project will be assessed by teacher observation, a step-by-step installation checklist, and a final project checklist.
<p>5. Lay out and construct wall framing.</p> <ul style="list-style-type: none"> a. Describe the different components of a wall layout. b. Explain the procedures for layout and assembly of interior and exterior wall frames. c. Perform layout and assembly of a given size wall. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Identify the components of a wall layout (Contren, Carpentry Level I, Wall and Ceiling Framing Unit).^{E3, E8} • Demonstrate the procedures for laying out a wood frame wall including plates, corner posts, door and window openings, partition T's, bracing, and fire stops.

<p>d. Calculate framing and sheathing materials needed for a wall assembly.</p>	<ul style="list-style-type: none"> • Demonstrate procedures for assembling and erecting an exterior wall. • Describe the common materials and methods used for installing sheathing on walls.^{E2} • Lay out, assemble, erect, and brace exterior walls for a frame building. • Describe wall framing techniques used in masonry construction. • Demonstrate the use of metal studs for wall framing. • Divide students into groups and have the students lay out and assemble a wall according to specifications provided. Students will estimate the materials required to frame walls as an individual exercise.^{A1, A5} <p>Assessment:</p> <ul style="list-style-type: none"> • Assessment of wall framing will use a procedure checklist. The estimation exercise will be assessed as correctly performed according to procedure checklist.
<p>6. Lay out and construct ceiling framing.</p> <p>a. Identify and describe the components needed to estimate and assemble a ceiling layout.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss and have students label the components of a ceiling layout (Contren, Carpentry Level I, Wall and Ceiling Framing Unit).^{E3, E8} • Demonstrate and have students perform the procedure for laying out a ceiling. • Estimate the materials required to frame ceilings.^{A1, A5} • Discuss the procedures for cutting and installing ceiling joists on a wood frame building.^{E2, E10} • Students will utilize the procedures to cut and construct ceiling framing. <p>Assessment:</p> <ul style="list-style-type: none"> • Assessment will use a procedure checklist for each activity.

<p>7. Describe principles of roof framing.</p> <ol style="list-style-type: none"> Define roof framing members and terms. Identify the basic roof styles. Discuss methods used to calculate the length of a rafter. Identify types of roof trusses. Calculate the length of a rafter for a given size roof. Identify various types of sheathing used in roof construction. Estimate materials needed to frame and sheath a given size roof. Frame a gable roof. Sheath and apply roofing felt on a gable roof. 	<p>Teaching:</p> <ul style="list-style-type: none"> Describe the various roof framing members and terms.^{E3, E8} Using hand outs and or text (Contren Level I Roof Framing Unit), describe the basic roof styles. (If possible, take a tour around the school campus and have students point out the different roof styles that they observe.) Using the text (Contren Level I Roof Framing Unit), overhead projector, or hand outs, describe the different types of roof trusses.^{E3, E8} Instruct the students how to calculate the length of a rafter on a given size roof using a framing square or speed square. The students will perform calculations using provided specifications.^{A1, A5} Describe the various types of roof sheathing by using small pieces of sheathing as examples.^{E2, E10} Use the marker board, instruct students on how to calculate materials needed to frame and sheath a given size roof. Students will calculate the materials from given specifications.^{A1, A5} Demonstrate how to properly frame a gable roof by using a small scale roof in the lab or by using a small building.^{E2, E10} Demonstrate how to properly install sheathing on a given size gable roof.^{E2, E10} Students will be divided into groups and will perform the proper procedures for framing and sheathing a gable roof. <p>Assessment:</p> <ul style="list-style-type: none"> The estimation activities will be assessed by checking the correct calculations. The framing and sheathing exercise will be assessed by a procedures checklist.
<p>8. Install windows and doors.</p> <ol style="list-style-type: none"> Describe the various types of windows commonly used in construction. List the parts of a window. State requirements for proper window 	<p>Teaching:</p> <ul style="list-style-type: none"> Using text (Contren Level I Windows and Exterior Doors Unit) and/or overhead projector, describe the various types of windows used in construction.^{E2, E3, E8, E10} Describe the parts of a window.

<p>installation.</p> <ul style="list-style-type: none"> d. Install a pre-hung window. e. Identify various types of doors commonly used in construction. f. Identify the parts of door construction. g. Identify types of thresholds used with exterior doors. h. Install pre-hung doors. i. Identify and install various types of locksets used on doors. 	<ul style="list-style-type: none"> • Have students label the parts of the various types of windows. • Discuss the requirements for proper window installation. Demonstrate how to measure and calculate window opening size and to properly install a pre-hung window.^{A1-6, E2, E10} • Have students install a pre-hung window. • Using text (Contren Level I Windows and Exterior Doors Unit) and/or overhead projector, describe the various types of exterior doors used in construction.^{E2, E3, E8, E10} • Discuss the requirements for proper door installation. Demonstrate how to measure and calculate door opening size and to properly install a pre-hung door.^{A1-6, E2, E10} • Have students install a pre-hung door. • Have students work in groups to research the various types of thresholds used on doors and to present the information to the class.^{E2, E3, E5, E9} • Have each student research various types of locksets, write a brief report describing the use of each, and demonstrate the use of one type.^{E1, E3, E4, E9, E10} <p>Assessment:</p> <ul style="list-style-type: none"> • The labeling exercise will be assessed using a correctly labeled drawing. • Installation of windows and pre-hung doors will be assessed with a procedures checklist. • Evaluate the group presentation with a rubric, including content, clarity, visual aids, and participation of all group members. • Evaluate the report with a rubric, including content, grammar, and organization.
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STANDARDS

Contren Learning Series Best Practices

Level I

Floor Systems

- FSY1 Identify the different types of framing systems.
- FSY2 Read and understand drawings and specifications to determine floor system requirements.
- FSY3 Identify floor and sill framing and support members.
- FSY4 Name the methods used to fasten sills to the foundation.
- FSY5 Given specific floor load and span data, select the proper girder/beam size from a list of available girders/beams.
- FSY6 List and recognize different types of floor joists.
- FSY7 Given specific floor load and span data, select the proper joist size from a list of available joists.
- FSY8 List and recognize different types of bridging.
- FSY9 List and recognize different types of flooring materials.
- FSY10 Explain the purposes of subflooring and underlayment.
- FSY11 Match selected fasteners used in floor framing to their correct uses.
- FSY12 Estimate the amount of material needed to frame a floor assembly.
- FSY13 Demonstrate the ability to:
 - Layout and construct a floor assembly
 - Install bridging
 - Install joists for a cantilever floor
 - Install a subfloor using butt-joint plywood/OSB panels
 - Install a single floor system using tongue-and-groove plywood/OSB panels
 - Install a single floor system using tongue-and-groove plywood/OSB panels.

Wall and Ceiling Framing

- WCF1 Identify the components of a wall and ceiling layout.
- WCF2 Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and firestops.
- WCF3 Describe the correct procedure for assembling and erecting an exterior wall.
- WCF4 Describe the common materials and methods used for installing sheathing on walls.
- WCF5 Layout, assemble, erect, and brace exterior walls for a frame building.
- WCF6 Describe wall framing techniques used in masonry construction.
- WCF7 Explain the use of metal studs in wall framing.
- WCF8 Describe the correct procedure for laying out a ceiling.
- WCF9 Cut and install ceiling joists on a wood frame building.
- WCF10 Estimate the materials required to frame walls and ceilings.

Roof Framing

- RFR1 Understand the terms associated with roof framing.
- RFR2 Identify the roof framing members used in gable and hip roofs.
- RFR3 Identify the methods used to calculate the length of a rafter.
- RFR4 Identify the various types of trusses used in roof framing.
- RFR5 Use a rafter framing square, speed square, and calculator in laying out a roof.
- RFR6 Identify various types of sheathing used in roof construction.
- RFR7 Frame a gable roof with vent openings.
- RFR8 Frame a roof opening.
- RFR9 Construct a frame roof, including hips, valleys, commons, jack rafters, and sheathing.
- RFR10 Erect a gable roof using trusses.
- RFR11 Estimate the materials used in framing and sheathing a roof.

Windows and Exterior Doors

- WED1 Identify various types of fixed, sliding, and swinging windows.
- WED2 Identify the parts of a window installation.
- WED3 State the requirements for a proper window installation.
- WED4 Install a pre-hung window.
- WED5 Identify the common types of skylights and roof windows.
- WED6 Describe the procedure for properly installing a skylight.
- WED7 Identify the common types of exterior doors and explain how they are constructed.
- WED8 Identify the parts of a door installation.
- WED9 Identify the types of thresholds used with exterior doors.
- WED10 Install a threshold on a concrete floor.
- WED11 Install a pre-hung exterior door with weather-stripping.
- WED12 Identify the various types of locksets used on exterior doors and explain how they are installed.
- WED13 Explain the correct installation procedure for a rollup garage door.
- WED14 Install a lockset.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A4 Explore and communicate the characteristics and operations of polynomials.
- A5 Utilize various formulas in problem-solving situations.
- A6 Communicate using the language of algebra.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.

- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T4 Technology communications tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Feirer, M. & Feirer, J. (2004). *Carpentry and Building construction*. Chicago: Glencoe/McGraw-Hill.

National Center for Construction Education and Research. (2001). *Carpentry level I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Vogt, F. (2003). *Residential construction academy carpentry*. Clifton Park, NY: Thomson/Delmar Learning.

Wagner, W., & Smith, H. (2000). *Modern carpentry*. Tinley Park, NY: Goodheart-Willcox.

Building Trades II**Unit 4: Advanced Electrical Wiring****(25 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Interpret wiring diagrams.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit to review wiring diagrams to include types of diagrams, symbols, and sequence of operation. The students will be given a wiring diagram and a scenario to interpret as a wiring project. ^{E2, E3, E8, E10} <p>Assessment:</p> <ul style="list-style-type: none"> The project will be assessed according to teacher observation and a wiring checklist.
<p>2. Demonstrate the ability to wire basic circuits based on the National Electrical Code (NEC).</p> <ol style="list-style-type: none"> Explain the difference between AC and DC currents. Explain the difference between conductors and insulators. Discuss the importance of the NEC. Wire various circuits. 	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit to discuss the difference between AC currents and DC currents. Have the students discuss the material and perform the activities provided. ^{E2, E3, E8, E10} Utilize the Contren Construction Technology Volume I, Wiring: Commercial and Industrial Unit to discuss the difference between conductors and insulators. Have the students discuss the material and perform the activities provided. ^{E2, E3, E8, E10} <p>Assessment:</p> <ul style="list-style-type: none"> The assessment for the activities is provided in the Contren Construction Technology Volume I Instructors Guide. The assessment for the activities is provided in the Contren Construction Technology Volume I Instructors Guide.
<p>3. Demonstrate methods of hand bending and threading conduit.</p> <ol style="list-style-type: none"> Identify the various methods used to bend and install conduit. Calculate conduit bends. Make conduit bends. 	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I to discuss the methods used to bend and install conduit. Have the students discuss the material and perform the activities provided. ^{E2, E3, E8, E10}

<p>d. Cut, ream, and thread conduit.</p>	<ul style="list-style-type: none"> • Use the Contren Construction Technology Volume I to explain the formulas needed to calculate bends in conduit. Provide the students with calculation problems related to bending conduit from teacher-made or Contren materials. ^{A1, A3, A5} • The students will be given bend specifications. They will decide the type of bend needed (90°, back-to-back, offsets, kicks, or saddle), calculate the bend, and perform the actual bend necessary to complete the project. ^{A1, A3, A5, E2, E3, E8, E10} • Discuss and demonstrate the methods used to cut, ream, and thread conduit. Students will cut, ream, and thread conduit according to provided specifications. <p>Assessment:</p> <ul style="list-style-type: none"> • The assessment for the activities is provided in the Contren Construction Technology Volume I Instructors Guide. • The assessment for the calculation problems is teacher-made answer key or provided in the Contren Construction Technology Volume I Instructors Guide. • The bend project will be assessed by a teacher-made checklist. • The assessment will be a performance evaluation checklist.
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STANDARDS

Contren Learning Series Best Practices

Level I

Electrical Safety

- ELS1 Demonstrate safe working procedures in a construction environment.
- ELS2 Explain the purpose of OSHA and how it promotes safety on-the-job.
- ELS3 Identify electrical hazards and how to avoid or minimize them in the workplace.
- ELS4 Explain safety issues concerning lockout/tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems.

Electrical Theory One

- ETO1 Recognize what atoms are and how they are constructed.
- ETO2 Define voltage and identify the ways in which it can be produced.
- ETO3 Explain the difference between conductors and insulators.
- ETO4 Define the units of measurement that are used to measure the properties of electricity.
- ETO5 Explain how voltage, current, and resistance are related to each other.
- ETO6 Using the formula for Ohm's Law, calculate an unknown value.
- ETO7 Explain the different types of meters used to measure voltage, current, and resistance.
- ETO8 Using the power formula, calculate the amount of power used by a circuit.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5 Utilize various formulas in problem-solving situations.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools

- T4 Technology communications tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Holzman, H. (1996). *Residential wiring*. Tinley, Park IL: Goodheart-Willcox.

Kibbe, R. (2002). *Mechanical systems for industrial maintenance*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (1998). *Construction technology volume I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades II
Unit 5: Advanced Masonry

(40 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Review terms and materials related to masonry trades.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Using Contren Core Text Introduction to Masonry Unit, provide students with a list of terms, types, and definitions relating to foundations.^{E1, E3} Have the students apply the terms by labeling and/or defining parts of a given foundation.^{E1, E3, E8} <p>Assessment:</p> <ul style="list-style-type: none"> Assess the activity by using the label or definition checklist.
<p>2. Identify and discuss drawings and specifications.</p> <ol style="list-style-type: none"> Match terms associated with specifications and drawings. Discuss the purposes of specifications. Identify commonly used scales for blueprints. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using Contren Core Text Introduction to Blueprints Unit, provide the students with handouts relating to terms, definitions, scales, and abbreviations.^{E3, E8} Given a set of blueprints, the students must identify the parts of the blueprint and identify the various plans.^{E3, E4, E8} Have the students draw a set of plans and label the parts and plans. <p>Assessment:</p> <ul style="list-style-type: none"> Assessment of the activity will be determined by the accuracy of the student drawn parts and plans.
<p>3. Estimate material for a masonry project.</p> <ol style="list-style-type: none"> List guidelines for estimating. Estimate material for a brick, block, and stone job. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using Contren Construction Technology Volume I, discuss the guidelines for estimating. Provide the student with a plan for a job relating to brick block and stone. The student will figure the estimation for each job. This may be done by hand and/or computer.^{A1, A2, A3} <p>Assessment:</p> <ul style="list-style-type: none"> Assessment for the estimation will be determined by the accuracy of the estimation.

<p>4. Explain and perform basic brick laying techniques.</p> <ol style="list-style-type: none"> Explain preparing materials and setting up the work area at a job site. Explain the steps to establish corners and leads and to set up a corner pole. Describe the steps in laying corners, coursing, and racking. Describe the properties of mortar bond and structural bond and a variety of patterned bonds. Perform the procedures used in tooling, brushing, pointing, and cleaning the completed structure. 	<p>Teaching:</p> <ul style="list-style-type: none"> Discuss the importance of basic brick laying techniques (Contren Construction Technology Volume I) and demonstrate the process.^{E2, E8} Have students perform a complete project from job set-up to finished masonry project in the lab. <p>Assessment:</p> <ul style="list-style-type: none"> The project will be assessed using a performance checklist.
<p>5. Build a wall to the required layout.</p> <ol style="list-style-type: none"> Explain where to begin the wall. Explain the type of wall to build. Lay a block and/or brick wall. 	<p>Teaching:</p> <ul style="list-style-type: none"> Provide the students with a drawing that explains where to begin and what type of wall to build (Contren Construction Technology Volume I).^{E3, E8} Given the proper materials, the students will demonstrate the proper procedure for building a wall.^{A1, A5} <p>Assessment:</p> <ul style="list-style-type: none"> Monitor student mastery by observing groups. Assessment will be determined by a checklist.

STANDARDS

Contren Learning Series Best Practices

Level I

Masonry Units and Installation Techniques

- MIT1 Describe the most common types of masonry units.
- MIT2 Describe and demonstrate setting up a wall.
- MIT3 Lay a dry bond.
- MIT4 Spread a furrowed bed joint and butter masonry units.
- MIT5 Describe the different types of masonry bonds.
- MIT6 Cut brick and block accurately.
- MIT7 Lay masonry units in a true course.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5 Utilize various formulas in problem-solving situations.
- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T4 Technology communications tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Kreh, R. T. (2003). *Masonry skills*. Clifton Park, NY: Thomson/Delmar Learning.

National Center for Construction Education and Research. (2002). *Construction technology volume I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Building Trades II
Unit 6: Advanced Plumbing

(20 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Review materials and tools used in plumbing trades.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Utilize the Contren Construction Technology Volume I Plumbing Level I Unit to review the types and sizes of pipe and fittings and relate each type to its specific application. Provide the students with a project specification. They will identify the pipe necessary to complete the project according to type, size, and fitting needed.^{E2, E3, E8, E10} Demonstrate the uses of various plumbing tools for the class. Provide each student with a description of a project to be completed. Have the student select the appropriate tool for the project and demonstrate its proper use to the class.^{E2, E3, E8, E10} <p>Assessment:</p> <ul style="list-style-type: none"> The project will be assessed using a rubric or checklist. Evaluate the selection of the proper tool for the assigned project and demonstration of its use.
<p>2. Read and interpret plumbing blueprint reading.</p> <ol style="list-style-type: none"> Describe the types of drawings that may be included in a set of residential plans. Identify the basic symbols used in schematic drawings of pipe assemblies. Apply the local code requirements to given drawings. Perform a material takeoff for a cold water piping and drain-waste-vent (DWV) system. 	<p>Teaching:</p> <ul style="list-style-type: none"> Using a blueprint, explain all plumbing terms, symbols, and abbreviations on the blueprint and how they are used to locate various elements. Give each student a copy of the symbols and abbreviations (Contren Core Text Introduction to Blueprints Unit). Discuss plumbing specifications and drawings, equipment schedules, blueprint components, and architect's and engineer's scales.^{E3, E8} Divide students into pairs and have them quiz each other on the terms and symbols. Have each student interpret a plan, plumbing specifications, and drawings; match them to an actual picture of the area; and interpret the information to the class.^{E2, E4, E9}

	<p>Assessment:</p> <ul style="list-style-type: none"> • Monitor group work as students quiz each other, and use a checklist of symbols to monitor student success (Contren Core Text Introduction to Blueprints Unit). • Determine if each student matches the plan to the correct picture, and evaluate his or her interpretation of the information to the class for accuracy, clarity, and presentation skills.
<p>3. Perform copper and plastic piping practices.</p> <ol style="list-style-type: none"> a. Select the correct tubing for a job. b. Cut and bend copper tubing. c. Join copper tubing using flare and compression fittings. d. Measure, cut, and join plastic pipe using appropriate fittings. e. Describe the basic requirements for pressure-testing a system once it has been installed. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss and demonstrate copper and plastic piping practices to include selecting materials, preparing the materials (i.e., threading, reaming and cutting, sweating), and performing a specified job. The students will be given job specifications and will have to select the proper materials, prepare the materials and fittings, and simulate performing the job. E2, E3, E8, E10 <p>Assessment:</p> <ul style="list-style-type: none"> • The job will be assessed by teacher observation and a performance evaluation.
<p>4. Perform soldering and brazing skills.</p> <ol style="list-style-type: none"> a. Assemble and operate tools used for soldering. b. Prepare tubing and fittings for soldering. c. Identify the purposes and use of solder and fluxes. d. Solder copper tubing and fittings. e. Assemble and operate tools used for brazing. f. Prepare tubing and fittings for brazing. g. Identify the purposes and use of filler metals and fluxes used for brazing. h. Braze copper tubing and fittings. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Explain safety procedures for soldering and brazing. Explain the purposes and use of solder, filler metal, and fluxes. • Discuss and demonstrate the procedures for assembly and operation of an oxy-acetylene torch. • Following the demonstration the students will solder copper tubing and fittings according to specifications. A1, E2, E3, E4, E10 <p>Assessment:</p> <ul style="list-style-type: none"> • Assessment for the activity will use a checklist or rubric.

STANDARDS

Contren Learning Series Best Practices

Level I

Soldering and Brazing

- SBR1 Assemble and operate the tools used for soldering.
- SBR2 Prepare tubing and fittings for soldering.
- SBR3 Identify the purposes and uses of solder and solder fluxes.
- SBR4 Solder copper tubing and fittings.
- SBR5 Assemble and operate the tools used for brazing.
- SBR6 Prepare tubing and fittings for brazing.
- SBR7 Identify the purposes and uses of filler metals and fluxes used for brazing.
- SBR8 Braze copper tubing and fittings.
- SBR9 Identify the inert gases that can safely be used to purge tubing when brazing.

Academic Standards

- A1 Recognize, classify, and use real numbers and their properties.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E10 Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 Basic operations and concepts
- T3 Technology productivity tools
- T4 Technology communications tools
- T6 Technology problem-solving and decision-making tools

Suggested References

Kibbe, R. (2002). *Mechanical systems for industrial maintenance*. Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2002). *Construction technology Volume I*. Upper Saddle River, NJ: Pearson Prentice Hall.

Recommended Tools and Equipment (for 20 Students)

CAPITALIZED ITEMS

1. Air compressor (1)
2. Cabinet, flammable materials (1)
3. Computer w/operating software w/multimedia kit and software for blueprint reading and estimation in building trades (1)
4. Drill, electro-matic (1)
5. Drill press, (14" w/vise) (1)
6. Dust collection system for shop (1)
7. Eye protection and sterilization chest (w/20 pr. safety glasses) (1)
8. Jackhammer (1)
9. Ladder, extension (32') (1)
10. Level, transit w/tripod and leveling rod (1)
11. Mixer, cement, gas or electric powered (1)
12. Printer, (1 per program)
13. Saw, motorized miter (1)
14. Saw, masonry (14" w/blade) (1)
15. Saw, radial arm (1)
16. Saw, table (1)
17. Saw, band (14") (1)
18. Saw, hand held band (1)
19. Scaffold kit (1)
20. Shears, power metal (1)
21. Table, workbench (4)
22. Table, metal shop (1)
23. Vise, pipe stand w/yoke (1)
24. Vise, pipe stand w/chain (1)

NON-CAPITALIZED ITEMS

1. Awl, scratch (2)
2. Ball, golf (1)
3. Bar, flat (2)
4. Bar, ripping (2)
5. Bender, copper tubing (1)
6. Bender, conduit (1/2"-3/4") (1)
7. Bender, spring tube (1)
8. Bin, revolving (1)
9. Bit set, auger (1/4"-1") (2)
10. Bit, expansion (2)
11. Box, mortar (15 cu. ft.) (1)
12. Brace, wood hand (4)
13. Brush, masonry (6)

14. Brush, wire (1)
15. Clamp, hand screw (2)
16. Clamp, locking C (2)
17. Clamp, pipe (2)
18. Clamp, spring (1)
19. Clamp, web (1)
20. C-clamp, vise grip (4)
21. C-clamp, assorted sizes (4)
22. Chalkline (2)
23. Chisel, cold (1)
24. Chisel, ripping (1)
25. Chisel set, wood ($\frac{1}{4}$ "-1 $\frac{1}{2}$ ") (2)
26. Chisel set, cold ($\frac{1}{4}$ "-1") (1)
27. Clamp, bar (4)
28. Cutter, bolt (1)
29. Cutter, PVC pipe (2)
30. Cutter, cable (2') (1)
31. Cutter, pipe (1)
32. Cutter, copper tubing (2)
33. Darby (1)
34. Die set, threader ratchet type ($\frac{3}{8}$ "-2") (1)
35. Dividers, wing (1)
36. Drill, hammer (1)
37. Drill, portable ($\frac{1}{2}$ ") (1)
38. Drill, cordless ($\frac{3}{8}$ ") (1)
39. Drill, pneumatic (1)
40. Drill set, spade ($\frac{1}{4}$ "-1 $\frac{1}{2}$ ") (1)
41. Drill set, twist ($\frac{1}{16}$ "- $\frac{1}{2}$ ") (1)
42. Drill, pneumatic (1)
43. Drill, portable ($\frac{1}{2}$ ", right angle) (1)
44. Drill, portable ($\frac{3}{8}$ ") (1)
45. Edger, cement (2)
46. Extension cord (25' 12/3 conductor) (6)
47. Extinguisher, fire (ABC) (2)
48. File, curved tooth (1)
49. File, metal double-cut (3)
50. File, wood (flat, assorted sizes) (6)
51. File, wood rasp (half-round) (1)
52. Flaring tool, copper tubing (2)
53. Float, rubber (2)
54. Grinder, angle (1)
55. Grinder, end (1)
56. Grinder, pedestal (1)
57. Groover, cement (2)
58. Gun, ram set (1)
59. Hacksaw (5)

60. Half hatchet (1)
61. Hammer, straight claw (6)
62. Hammer, sledge (3)
63. Hammer, ball peen (2)
64. Hammer, brick (4)
65. Hammer, curved claw (16 oz.) (6)
66. Handsaw, rip (4)
67. Handsaw, crosscut (8)
68. Hawk, plastering (2)
69. Hods (1)
70. Hoe, mortar (2)
71. Hose, water (50') (2)
72. Hose, air (50') (2)
73. Joiner, sled block (6)
74. Jointer, rake bricklaying (6)
75. Jointer, concave bricklaying (6)
76. Knife, putty (4") (2)
77. Knife, putty (6") (2)
78. Knife, putty (2") (2)
79. Knife, utility (2)
80. Ladder, straight (1)
81. Ladder, step (4') (1)
82. Ladder, step (6') (1)
83. Ladder, step (8') (1)
84. Level, carpenter's aluminum (48") (2)
85. Level, carpenter's aluminum (24") (2)
86. Level, masonry (48") (8)
87. Level, spirit (1)
88. Light, electrical circuit tester (120V and 240V) (6)
89. Mallet, wood (2)
90. Mallet, rubber (1)
91. Mason, mashes (1)
92. Nailpuller (1)
93. Nailer, pneumatic (1)
94. Plane, jack (2)
95. Plane, jointer 1)
96. Plane, block (2)
97. Planer, portable electric (1)
98. Plane, smooth (1)
99. Pliers, channel lock (12") (2)
100. Pliers, diagonal (6)
101. Pliers, lineman's (side cutters) (8)
102. Pliers, needlenose (8)
103. Pliers, joint (6)
104. Pliers, vise grip (2)
105. Plumb bob (2)

106. Pouch, electrician's tool (6)
107. Reamer, pipe (1)
108. Ripper, cable (6)
109. Router, w/bits (1)
110. Rule, folding (6') (6)
111. Rule, folding (6' modular) (6)
112. Rule, spacer (1)
113. Safety kit (OSHA approved) (1)
114. Sander, belt (1)
115. Sander, finish (1)
116. Sander, portable finishing (1)
117. Saw, back (2)
118. Saw, random orbital (1)
119. Saw, circular (7½" portable) (3)
120. Saw, coping (2)
121. Saw, dove tail (1)
122. Saw, keyhole (2)
123. Saw, saber (1)
124. Saw, reciprocating (1)
125. Sawhorse (3 pair)
126. Screwdriver set (Phillips, assorted sizes) (10)
127. Screwdriver set (spiral w/bits) (2)
128. Screwdriver set (flat blade, assorted sizes) (10)
129. Screwgun (1)
130. Set, nail (6)
131. Set, brick (2)
132. Shield safety (5)
133. Shovel, round point (2)
134. Shovel, square point (2)
135. Snips, aviation (2)
136. Snips, tin (2)
137. Solder gun (2)
138. Square, framing w/rafter chart (6)
139. Square, combination (6)
140. Square, speed and booklet (3)
141. Square, try (6)
142. Stripper, wire (8)
143. Stick, push (1)
144. T-bevel (2)
145. Tamper, hand (1)
146. Tape, steel (100') (2)
147. Tape, steel (16') (8)
148. Tester, voltage (multimeter) (1)
149. Tong, brick (2)
150. Torch, propane (2)
151. Torch, striker (2)

152. Trowel, bricklaying (20)
153. Trowel, tuck point (1)
154. Trowel, cement finishing (2)
155. Vise, woodworking (5") (8)
156. Wheelbarrow, (6 cu. ft.) (3)
157. Wheelbarrow, brick (1)
158. Wrench, basin (1)
159. Wrench, pipe (8") (2)
160. Wrench, pipe (10") (2)
161. Wrench, pipe (12") (2)
162. Wrench set, combination (SAE) (1)
163. Wrench, torque (1)
164. Wrench, adjustable (12") (1)
165. Wrench, adjustable (10") (1)
166. Wrench, pipe (14") (1)
167. Wrench, adjustable (8") (1)
168. Wrench, pipe, (16") (1)
169. Wrench, seat (1)
170. Wrench set, combination (Metric) (1)
171. Wrench set, sockets w/ratchets and pullhandles (SAE 1/4", 3/8", and 1/2" drives) (2)
172. Wrench set, sockets w/ratchets and pullhandles (Metric 1/4", 3/8", and 1/2" drives) (2)

RECOMMENDED INSTRUCTIONAL AIDS

It is recommended that instructors have access to the following items:

1. TV-VCR (1)
2. Video out (Microcomputer to TV monitor) (1)

Student Competency Profile for Building Trades I

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Introduction and Orientation

- _____ 1. Describe local program and vocational center policies and procedures.
- _____ 2. Describe employment opportunities and responsibilities.
- _____ 3. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.
- _____ 4. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.
- _____ 5. Discuss the history of building trades to include materials and techniques.

Unit 2: Basic Safety

- _____ 1. Describe general safety rules for working in a shop/lab and industry.
- _____ 2. Identify and apply safety around welding operations.
- _____ 3. Identify and explain use of various barriers and confinements.
- _____ 4. Explain lifting and the use of ladders and scaffolds.
- _____ 5. Explain the Material Safety Data Sheet (MSDS).
- _____ 6. Explain fires.
- _____ 7. Explain safety in and around electrical situations.

Unit 3: Basic Math

- _____ 1. Apply the four basic math skills with whole numbers, fractions, and percent.
- _____ 2. Use the metric system.
- _____ 3. Apply basic math for building trades.

Unit 4: Hand and Power Tools

- _____ 1. Demonstrate the use and maintenance of hand and power tools.

Unit 5: Introduction to Blueprints

- _____ 1. Read, analyze, and design a blueprint.

Unit 6: Materials Used in Building Trades

- _____1. Describe wood building materials used in the building trades.
- _____2. Describe wood building fasteners and adhesives used in the construction industry.

Unit 7: Basic Rigging

- _____1. Explain and identify safe rigging and equipment.
- _____2. Discuss the proper use of load-handling and signaling practices.

Unit 8: Introduction to Carpentry

- _____1. Explain the fundamentals of the carpentry trade.
- _____2. Identify and define terms used in the carpentry trade.
- _____3. Demonstrate safety when working in carpentry.
- _____4. Review and discuss materials used in carpentry.
- _____5. Review and discuss tools used in carpentry trades.

Unit 9: Introduction to Electrical Wiring

- _____1. Demonstrate safety in and around electrical circuits and equipment.
- _____2. Describe/identify basic electricity.

Unit 10: Introduction to Masonry

- _____1. Explain the fundamentals of the masonry trade.
- _____2. Explain and define terms and materials associated with masonry.
- _____3. Identify and discuss safety issues in and around the masonry worksite.
- _____4. Perform procedures used in masonry trades.

Unit 11: Introduction to Plumbing

- _____1. Describe the fundamentals of the plumbing trade.
- _____2. Identify and discuss materials used in plumbing trades.
- _____3. Identify and discuss tools used in plumbing trades.
- _____4. Perform a basic plumbing operation.

Student Competency Profile for Building Trades II

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation Review

- _____ 1. Review local program and vocational center policies and procedures.
- _____ 2. Review employment opportunities and responsibilities.
- _____ 3. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA.
- _____ 4. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.

Unit 2: Basic Safety (Review and Reinforcement)

- _____ 1. Describe general safety rules for working in a shop/lab and industry.
- _____ 2. Identify and apply safety around welding operations.
- _____ 3. Identify and explain use of various barriers and confinements.
- _____ 4. Explain lifting and the use of ladders and scaffolds.
- _____ 5. Explain the Material Safety Data Sheet (MSDS).
- _____ 6. Explain fires.
- _____ 7. Explain safety in and around electrical situations.

Unit 3: Advance Carpentry

- _____ 1. Define and apply terms and types of foundations.
- _____ 2. Plan a footing and/or foundation.
- _____ 3. Identify and plan floor systems.
- _____ 4. Construct floor systems.
- _____ 5. Lay out and construct wall framing.
- _____ 6. Lay out and construct ceiling framing.
- _____ 7. Describe principles of roof framing.
- _____ 8. Install windows and doors.

Unit 4: Advanced Electrical Wiring

- _____ 1. Interpret wiring diagrams.
- _____ 2. Demonstrate the ability to wire basic circuits based on the National Electrical Code (NEC).

- ____3. Demonstrate methods of hand bending and threading conduit.

Unit 5: Advanced Masonry

- ____1. Review terms and materials related to masonry trades.
- ____2. Identify and discuss drawings and specifications.
- ____3. Estimate material for a masonry project.
- ____4. Explain and perform basic brick laying techniques.
- ____5. Build a wall to the required layout.

Unit 6: Advanced Plumbing

- ____1. Review materials and tools used in plumbing trades.
- ____2. Read and interpret plumbing blueprint reading.
- ____3. Perform copper and plastic piping practices.
- ____4. Perform soldering and brazing skills.

Appendix A: Contren Learning Series Best Practices¹

Core Curriculum Best Practices

BASIC SAFETY

- SAF1 Identify the responsibilities and personal characteristics of a professional craftsperson.
- SAF2 Explain the role that safety plays in the construction crafts.
- SAF3 Describe what job-site safety means.
- SAF4 Explain the appropriate safety precautions around common job-site hazards.
- SAF5 Demonstrate the use and care of appropriate personal protective equipment.
- SAF5 Follow safe procedures for lifting heavy objects.
- SAF6 Describe safe behavior on and around ladders and scaffolds.
- SAF7 Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDSs (Material Safety Data Sheets).
- SAF8 Describe fire prevention and fire fighting techniques.
- SAF9 Define safe work procedures around electrical hazards.

INTRODUCTION TO CONSTRUCTION MATH

- MAT1 Add, subtract, multiply, and divide whole numbers, with and without a calculator.
- MAT2 Use a standard ruler and a metric ruler to measure.
- MAT3 Add, subtract, multiply, and divide fractions.
- MAT4 Add, subtract, multiply, and divide decimals, with and without a calculator.
- MAT5 Convert decimals to percents and percents to decimals.
- MAT6 Convert fractions to decimals and decimals to fractions.
- MAT7 Explain what the metric system is and how it is important in the construction trade.
- MAT8 Recognize and use metric units of length, weight, volume, and temperature.
- MAT9 Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

INTRODUCTION TO HAND TOOLS

- HTO1 Recognize and identify some of the basic hand tools used in the construction trade.
- HTO2 Use these tools safely.
- HTO3 Describe the basic procedures for taking care of these tools.

INTRODUCTION TO POWER TOOLS

- PTO1 Identify commonly used power tools of the construction trade.
- PTO2 Use power tools safely.
- PTO3 Explain how to maintain power tools properly.

¹ Contren learning series. Retrieved October 7, 2004, from <http://www.nccer.org/>

INTRODUCTION TO BLUEPRINTS

- BLU1 Recognize and identify basic blueprint terms, components, and symbols.
- BLU2 Relate information on blueprints to actual locations on the print.
- BLU3 Recognize different classifications of drawings.
- BLU4 Interpret and use drawing dimensions.

BASIC RIGGING

- RIG1 Identify and describe the use of slings and common rigging hardware.
- RIG2 Describe the basic inspection techniques and rejection criteria used for slings and hardware.
- RIG3 Describe the basic hitch configurations and their proper connections.
- RIG4 Describe basic load-handling safety practices.
- RIG5 Demonstrate proper use of American National Standards Institute (ANSI) hand signals.

COMMUNICATION SKILLS

- COM1 Demonstrate the ability to understand information and instructions that are presented in both written and verbal form.
- COM2 Demonstrate the ability to communicate effectively in on-the-job situations using written and verbal skills.

EMPLOYABILITY SKILLS

- EMP1 Explain the construction industry, the role of the companies that make up the industry, and the role of individual professionals in the industry.
- EMP2 Demonstrate critical thinking skills and the ability to solve problems using those skills.
- EMP3 Demonstrate knowledge of computer systems and explain common uses for computers in the construction industry.
- EMP4 Demonstrate effective relationship skills with teammates and supervisors, exhibit the ability to work on a team, and demonstrate appropriate leadership skills.
- EMP5 Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

CONSTRUCTION TECHNOLOGY VOLUME I - ELECTRICAL SAFETY

- ELS1 Demonstrate safe working procedures in a construction environment.
- ELS2 Explain the purpose of OSHA and how it promotes safety on-the-job.
- ELS3 Identify electrical hazards and how to avoid or minimize them in the workplace.
- ELS4 Explain safety issues concerning lockout/tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems.

INDUSTRIAL MAINTENANCE LEVEL I – ELECTRICAL THEORY ONE

- ETO1 Recognize what atoms are and how they are constructed.
- ETO2 Define voltage and identify the ways in which it can be produced.
- ETO3 Explain the difference between conductors and insulators.

- ETO4 Define the units of measurement that are used to measure the properties of electricity.
- ETO5 Explain how voltage, current, and resistance are related to each other.
- ETO6 Using the formula for Ohm's Law, calculate an unknown value.
- ETO7 Explain the different types of meters used to measure voltage, current, and resistance.
- ETO8 Using the power formula, calculate the amount of power used by a circuit.

CONSTRUCTION TECHNOLOGY VOLUME I - MASONRY UNITS AND INSTALLATION TECHNIQUES

- MIT1 Describe the most common types of masonry units.
- MIT2 Describe and demonstrate setting up a wall.
- MIT3 Lay a dry bond.
- MIT4 Spread a furrowed bed joint and butter masonry units.
- MIT5 Describe the different types of masonry bonds.
- MIT6 Cut brick and block accurately.
- MIT7 Lay masonry units in a true course.

CONSTRUCTION TECHNOLOGY VOLUME I - PLASTIC PIPE AND FITTINGS

- PPF1 Identify the common types of materials and schedules of plastic piping.
- PPF2 Identify the common types of fittings and valves used with plastic piping.
- PPF3 Identify and determine the kinds of hangers and supports needed for plastic piping.
- PPF4 Identify the various techniques used in hanging and supporting plastic piping.
- PPF5 Demonstrate the ability to properly measure, cut, and join plastic piping.
- PPF6 Follow basic safety precautions for the installation, operation, and maintenance of plastic tubing.
- PPF7 Identify the hazards and safety precautions associated with plastic piping.

CONSTRUCTION TECHNOLOGY VOLUME I - COPPER PIPE AND FITTINGS

- CPF1 Identify the common types of materials and schedules used with copper piping.
- CPF2 Identify the common types of fittings and valves used with copper piping.
- CPF3 Identify the techniques used in hanging and supporting copper piping.
- CPF4 Demonstrate the ability to properly measure, units, ream, cut, and join copper piping.
- CPF5 Identify the hazards and safety precautions

CONSTRUCTION TECHNOLOGY VOLUME I - INTRODUCTION TO DRAIN, WASTE, AND VENT SYSTEMS

- DWV1 Explain how waste moves from a fixture through the drain system to the environment.
- DWV2 Identify the major components of a drainage system and describe their functions.
- DWV3 Identify types and parts of traps and explain the importance of traps, and how traps lose their seals.
- DWV4 Identify the various types of DWV fittings and describe their applications.

CARPENTRY LEVEL I - FLOOR SYSTEMS

- FSY1 Identify the different types of framing systems.
- FSY2 Read and understand drawings and specifications to determine floor system requirements.
- FSY3 Identify floor and sill framing and support members.
- FSY4 Name the methods used to fasten sills to the foundation.
- FSY5 Given specific floor load and span data, select the proper girder/beam size from a list of available girders/beams.
- FSY6 List and recognize different types of floor joists.
- FSY7 Given specific floor load and span data, select the proper joist size from a list of available joists.
- FSY8 List and recognize different types of bridging.
- FSY9 List and recognize different types of flooring materials.
- FSY10 Explain the purposes of subflooring and underlayment.
- FSY11 Match selected fasteners used in floor framing to their correct uses.
- FSY12 Estimate the amount of material needed to frame a floor assembly.
- FSY13 Demonstrate the ability to:
- Layout and construct a floor assembly
 - Install bridging
 - Install joists for a cantilever floor
 - Install a subfloor using butt-joint plywood/OSB panels
 - Install a single floor system using tongue-and-groove plywood/OSB panels
 - Install a single floor system using tongue-and-groove plywood/OSB panels.

CARPENTRY LEVEL I - WALL AND CEILING FRAMING

- WCF1 Identify the components of a wall and ceiling layout.
- WCF2 Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and firestops.
- WCF3 Describe the correct procedure for assembling and erecting an exterior wall.
- WCF4 Describe the common materials and methods used for installing sheathing on walls.
- WCF5 Layout, assemble, erect, and brace exterior walls for a frame building.
- WCF6 Describe wall framing techniques used in masonry construction.
- WCF7 Explain the use of metal studs in wall framing.
- WCF8 Describe the correct procedure for laying out a ceiling.
- WCF9 Cut and install ceiling joists on a wood frame building.
- WCF10 Estimate the materials required to frame walls and ceilings.

CARPENTRY LEVEL I - ROOF FRAMING

- RFR1 Understand the terms associated with roof framing.
- RFR2 Identify the roof framing members used in gable and hip roofs.
- RFR3 Identify the methods used to calculate the length of a rafter.
- RFR4 Identify the various types of trusses used in roof framing.
- RFR5 Use a rafter framing square, speed square, and calculator in laying out a roof.
- RFR6 Identify various types of sheathing used in roof construction.
- RFR7 Frame a gable roof with vent openings.

- RFR8 Frame a roof opening.
- RFR9 Construct a frame roof, including hips, valleys, commons, jack rafters, and sheathing.
- RFR10 Erect a gable roof using trusses.
- RFR11 Estimate the materials used in framing and sheathing a roof.

CARPENTRY LEVEL I - WINDOWS AND EXTERIOR DOORS

- WED1 Identify various types of fixed, sliding, and swinging windows.
- WED2 Identify the parts of a window installation.
- WED3 State the requirements for a proper window installation.
- WED4 Install a pre-hung window.
- WED5 Identify the common types of skylights and roof windows.
- WED6 Describe the procedure for properly installing a skylight.
- WED7 Identify the common types of exterior doors and explain how they are constructed.
- WED8 Identify the parts of a door installation.
- WED9 Identify the types of thresholds used with exterior doors.
- WED10 Install a threshold on a concrete floor.
- WED11 Install a pre-hung exterior door with weather-stripping.
- WED12 Identify the various types of locksets used on exterior doors and explain how they are installed.
- WED13 Explain the correct installation procedure for a rollup garage door.
- WED14 Install a lockset.

HEATING, VENTILATION, AND AIR CONDITIONING - SOLDERING AND BRAZING

- SBR1 Assemble and operate the tools used for soldering.
- SBR2 Prepare tubing and fittings for soldering.
- SBR3 Identify the purposes and uses of solder and solder fluxes.
- SBR4 Solder copper tubing and fittings.
- SBR5 Assemble and operate the tools used for brazing.
- SBR6 Prepare tubing and fittings for brazing.
- SBR7 Identify the purposes and uses of filler metals and fluxes used for brazing.
- SBR8 Braze copper tubing and fittings.
- SBR9 Identify the inert gases that can safely be used to purge tubing when brazing.

Appendix B: Academic Standards

Algebra I²

Competencies and Suggested Objective(s)

- A1 Recognize, classify, and use real numbers and their properties.
- Describe the real number system using a diagram to show the relationships of component sets of numbers that compose the set of real numbers.
 - Model properties and equivalence relationships of real numbers.
 - Demonstrate and apply properties of real numbers to algebraic expressions.
 - Perform basic operations on square roots excluding rationalizing denominators.
- A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- Analyze relationships between two variables, identify domain and range, and determine whether a relation is a function.
 - Explain and illustrate how change in one variable may result in a change in another variable.
 - Determine the rule that describes a pattern and determine the pattern given the rule.
 - Apply patterns to graphs and use appropriate technology.
- A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- Solve, check, and graph linear equations and inequalities in one variable, including rational coefficients.
 - Graph and check linear equations and inequalities in two variables.
 - Solve and graph absolute value equations and inequalities in one variable.
 - Use algebraic and graphical methods to solve systems of linear equations and inequalities.
 - Translate problem-solving situations into algebraic sentences and determine solutions.
- A4 Explore and communicate the characteristics and operations of polynomials.
- Classify polynomials and determine the degree.
 - Add, subtract, multiply, and divide polynomial expressions.
 - Factor polynomials using algebraic methods and geometric models.
 - Investigate and apply real-number solutions to quadratic equations algebraically and graphically.
 - Use convincing arguments to justify unfactorable polynomials.
 - Apply polynomial operations to problems involving perimeter and area.
- A5 Utilize various formulas in problem-solving situations.
- Evaluate and apply formulas (e.g., circumference, perimeter, area, volume, Pythagorean Theorem, interest, distance, rate, and time).
 - Reinforce formulas experimentally to verify solutions.
 - Given a literal equation, solve for any variable of degree one.

² *Mississippi mathematics framework—Algebra I*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/mathematics/ma_algebra_i.html

- d. Using the appropriate formula, determine the length, midpoint, and slope of a segment in a coordinate plane.
- e. Use formulas (e.g., point-slope and slope-intercept) to write equations of lines.
- A6 Communicate using the language of algebra.
 - a. Recognize and demonstrate the appropriate use of terms, symbols, and notations.
 - b. Distinguish between linear and non-linear equations.
 - c. Translate between verbal expressions and algebraic expressions.
 - d. Apply the operations of addition, subtraction, and scalar multiplication to matrices.
 - e. Use scientific notation to solve problems.
 - f. Use appropriate algebraic language to justify solutions and processes used in solving problems.
- A7 Interpret and apply slope as a rate of change.
 - a. Define slope as a rate of change using algebraic and geometric representations.
 - b. Interpret and apply slope as a rate of change in problem-solving situations.
 - c. Use ratio and proportion to solve problems including direct variation ($y=kx$).
 - d. Apply the concept of slope to parallel and perpendicular lines.
- A8 Analyze data and apply concepts of probability.
 - a. Collect, organize, graph, and interpret data sets, draw conclusions, and make predictions from the analysis of data.
 - b. Define event and sample spaces and apply to simple probability problems.
 - c. Use counting techniques, permutations, and combinations to solve probability problems.

Biology I³

Competencies and Suggested Objective(s)

- B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
 - a. Demonstrate the proper use and care for scientific equipment used in biology.
 - b. Observe and practice safe procedures in the classroom and laboratory.
 - c. Apply the components of scientific processes and methods in the classroom and laboratory investigations.
 - d. Communicate results of scientific investigations in oral, written, and graphic form.
- B2 Investigate the biochemical basis of life.
 - a. Identify the characteristics of living things.
 - b. Describe and differentiate between covalent and ionic bonds using examples of each.
 - c. Describe the unique bonding and characteristics of water that makes it an essential component of living systems.
 - d. Classify solutions using the pH scale and relate the importance of pH to organism survival.

³ *Mississippi science framework—Biology I*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/science/sci_biology_I.html

- e. Compare the structure, properties and functions of carbohydrates, lipids, proteins and nucleic acids in living organisms.
- f. Explain how enzymes work and identify factors that can affect enzyme action.
- B3 Investigate cell structures, functions, and methods of reproduction.
 - a. Differentiate between prokaryotic and eukaryotic cells.
 - b. Distinguish between plant and animal (eukaryotic) cell structures.
 - c. Identify and describe the structure and basic functions of the major eukaryotic organelles.
 - d. Describe the way in which cells are organized in multicellular organisms.
 - e. Relate cell membrane structure to its function in passive and active transport.
 - f. Describe the main events in the cell cycle and cell mitosis including differences in plant and animal cell divisions.
 - g. Relate the importance of meiosis to sexual reproduction and the maintenance of chromosome number.
 - h. Identify and distinguish among forms of asexual and sexual reproduction.
- B4 Investigate the transfer of energy from the sun to living systems.
 - a. Describe the structure of ATP and its importance in life processes.
 - b. Examine, compare, and contrast the basic processes of photosynthesis and cellular respiration.
 - c. Compare and contrast aerobic and anaerobic respiration.
- B5 Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
 - a. Compare and contrast the molecular structures of DNA and RNA as they relate to replication, transcription, and translation.
 - b. Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.
 - c. Analyze the applications of DNA technology (forensics, medicine, agriculture).
 - d. Discuss the significant contributions of well-known scientists to the historical progression of classical and molecular genetics.
 - e. Apply genetic principles to solve simple inheritance problems including monohybrid crosses, sex linkage, multiple alleles, incomplete dominance, and codominance.
 - f. Examine inheritance patterns using current technology (gel electrophoresis, pedigrees, karyotypes).
- B6 Investigate concepts of natural selection as they relate to diversity of life.
 - a. Analyze how organisms are classified into a hierarchy of groups and subgroups based on similarities and differences.
 - b. Identify characteristics of kingdoms including monerans, protists, fungi, plants and animals.
 - c. Differentiate among major divisions of the plant and animal kingdoms (vascular/non-vascular; vertebrate/invertebrate).
 - d. Compare the structures and functions of viruses and bacteria relating their impact on other living organisms.
 - e. Identify evidence of change in species using fossils, DNA sequences, anatomical and physiological similarities, and embryology.

- f. Analyze the results of natural selection in speciation, diversity, adaptation, behavior and extinction.
- B7 Investigate the interdependence and interactions that occur within an ecosystem.
 - a. Analyze the flow of energy and matter through various cycles including carbon, oxygen, nitrogen and water cycles.
 - b. Interpret interactions among organisms in an ecosystem (producer/consumer/decomposer, predator/prey, symbiotic relationships and competitive relationships).
 - c. Compare variations, tolerances, and adaptations of plants and animals in major biomes.
 - d. Investigate and explain the transfer of energy in an ecosystem including food chains, food webs, and food pyramids.
 - e. Examine long and short-term changes to the environment as a result of natural events and human actions.

English II⁴

Competencies and Suggested Objective(s)

- E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
 - a. Produce individual and/or group compositions and/or projects to persuade, tell a story, describe, create an effect, explain or justify an action or event, inform, entertain, etc.
 - b. Produce writing typically used in the workplace such as social, business, and technical correspondence; explanation of procedures; status reports; research findings; narratives for graphs; justification of decisions, actions, or expenses; etc.
 - c. Write a response, reaction, interpretation, analysis, summary, etc., of literature, other reading matter, or orally presented material.
 - d. Revise to ensure effective introductions, details, wording, topic sentences, and conclusions.
- E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
 - a. Listen to determine the main idea and supporting details, to distinguish fact from opinion, and to determine a speaker's purpose or bias.
 - b. Speak with appropriate intonation, articulation, gestures, and facial expression.
 - c. Speak effectively to explain and justify ideas to peers, to inform, to summarize, to persuade, to entertain, to describe, etc.
- E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
 - a. Read, view, and listen to distinguish fact from opinions and to recognize persuasive and manipulative techniques.
 - b. Access both print and non-print sources to produce an I-Search paper, research paper, or project.

⁴ *Mississippi language arts framework—English II*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/language_arts/la_10.html

- c. Use computers and audio-visual technology to access and organize information for purposes such as resumes, career search projects, and analytical writings, etc.
 - d. Use reference sources, indices, electronic card catalog, and appropriate research procedures to gather and synthesize information.
- E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
 - a. Interact with peers to examine real world and literary issues and ideas.
 - b. Show growth in critical thinking, leadership skills, consensus building, and self-confidence by assuming a role in a group, negotiating compromise, and reflecting on individual or group work.
- E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
 - a. Share, critique, and evaluate works in progress and completed works through a process approach.
 - b. Communicate effectively in a group to present completed projects and/or compositions.
 - c. Edit oral and written presentations to reflect correct grammar, usage, and mechanics.
- E6 Explore cultural contributions to the history of the English language and its literature.
 - a. Explore a variety of works from various historical periods, geographical locations, and cultures, recognizing their influence on language and literature.
 - b. Identify instances of dialectal differences which create stereotypes, perceptions, and identities.
 - c. Recognize root words, prefixes, suffixes, and cognates.
 - d. Relate how vocabulary and spelling have changed over time.
- E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
 - a. Listen to and read aloud selected works to recognize and respond to the rhythm and power of language to convey a message.
 - b. Read aloud with fluency and expression.
 - c. Analyze the stylistic devices, such as alliteration, assonance, word order, rhyme, onomatopoeia, etc., that make a passage achieve a certain effect.
 - d. Demonstrate how the use of language can confuse or inform, repel or persuade, or inspire or enrage.
 - e. Analyze how grammatical structure or style helps to create a certain effect.
- E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
 - a. Read and explore increasingly complete works, both classic and contemporary, for oral discussion and written analysis.
 - b. Read, discuss, and interpret literature to make connections to life.
 - c. Read from a variety of genres to understand how the literary elements contribute to the overall quality of the work.
 - d. Identify qualities in increasingly complex literature that have produced a lasting impact on society.

- e. Read for enjoyment, appreciation, and comprehension of plot, style, vocabulary, etc.
- E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
 - a. Infuse the study of grammar and vocabulary into written and oral communication.
 - b. Demonstrate, in the context of their own writing, proficient use of the conventions of standard English, including, but not limited to, the following: complete sentences, subject-verb agreement, plurals, spellings, homophones, possessives, verb forms, punctuation, capitalization, pronouns, pronoun-antecedent agreement, parallel structure, and dangling and misplaced modifiers.
 - c. Give oral presentations to reinforce the use of standard English.
 - d. Employ increasingly proficient editing skills to identify and solve problems in grammar, usage, and structure.
- E10 Use language and critical thinking strategies to serve as tools for learning.
 - a. Use language to facilitate continuous learning, to record observations, to clarify thought, to synthesize information, and to analyze and evaluate language.
 - b. Interpret visual material orally and in writing.

U. S. History from 1877⁵

Competencies and Suggested Objective(s)

- H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
 - a. Apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues (e.g., gold standard, free coinage of silver, tariff issue, laissez faire, deficit spending, etc.).
 - b. Explain the emergence of modern America from a domestic perspective (e.g., frontier experience, Industrial Revolution and organized labor, reform movements of Populism and Progressivism, Women's Movement, Civil Rights Movement, the New Deal, etc.).
 - c. Explain the changing role of the United States in world affairs since 1877 through wars, conflicts, and foreign policy (e.g., Spanish-American War, Korean conflict, containment policy, etc.).
 - d. Trace the expansion of the United States and its acquisition of territory from 1877 (e.g., expansionism and imperialism).
- H2 Describe the impact of science and technology on the historical development of the United States in the global community.
 - a. Analyze the impact of inventions on the United States (e.g., telephone, light bulb, etc.).
 - b. Examine the continuing impact of the Industrial Revolution on the development of our nation (e.g., mass production, computer operations, etc.).
 - c. Describe the effects of transportation and communication advances since 1877.

⁵ *Mississippi social studies framework—U.S. History from 1877*. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/social_studies/ss_us_history.html

- H3 Describe the relationship of people, places, and environments through time.
 - a. Analyze human migration patterns since 1877 (e.g., rural to urban, the Great Migration, etc.).
 - b. Analyze how changing human, physical, geographic characteristics can alter a regional landscape (e.g., urbanization, Dust Bowl, etc.).
- H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).
 - a. Interpret special purpose maps, primary/secondary sources, and political cartoons.
 - b. Analyze technological information on graphs, charts, and timelines.
 - c. Locate areas of international conflict (e.g., Caribbean, Southeast Asia, Europe, etc.).
- H5 Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.
 - a. Examine various reform movements (e.g., Civil Rights, Women's Movement, etc.).
 - b. Examine the government's role in various movements (e.g., arbitration, 26th Amendment, etc.).
 - c. Examine the role of government in the preservation of citizens' rights (e.g., 19th Amendment, Civil Rights Act of 1964).
 - d. Examine individuals' duties and responsibilities in a democratic society (e.g., voting, volunteerism, etc.).

Appendix C: Workplace Skills for the 21st Century⁶

- WP1 Allocates resources (time, money, materials and facilities, and human resources).
- WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5 Selects, applies, and maintains/troubleshoots technology.
- WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

⁶ *Secretary's commission on achieving necessary skills*. Retrieved July 13, 2004, from <http://wdr.doleta.gov/SCANS/>

Appendix D: National Educational Technology Standards for Students⁷

- T1 Basic operations and concepts
 - Students demonstrate a sound understanding of the nature and operation of technology systems.
 - Students are proficient in the use of technology.
- T2 Social, ethical, and human issues
 - Students understand the ethical, cultural, and societal issues related to technology.
 - Students practice responsible use of technology systems, information, and software.
 - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- T3 Technology productivity tools
 - Students use technology tools to enhance learning, increase productivity, and promote creativity.
 - Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.
- T4 Technology communications tools
 - Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
 - Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
- T5 Technology research tools
 - Students use technology to locate, evaluate, and collect information from a variety of sources.
 - Students use technology tools to process data and report results.
 - Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
- T6 Technology problem-solving and decision-making tools
 - Students use technology resources for solving problems and making informed decisions.
 - Students employ technology in the development of strategies for solving problems in the real world.

⁷ ISTE: *National educational technology standards (NETS)*. Retrieved July 13, 2004, from <http://cnets.iste.org/>